

SEPTEMBER 1963

35 CENTS ICD

SCIENCE DIGEST

HOW TO AVOID A HEART ATTACK

Meet Johnny Foster
THE MAN BEHIND
AMERICA'S NEW
NUCLEAR POWER

WHAT'S WRONG WITH
DETERGENTS



THE RISE OF
RUSSIAN WOMEN
By one who married
an American



ARE YOU NORMAL?

Test yourself

How we'll rescue
men in space



Pop goes the penny

CHILL an empty soda bottle in the refrigerator. Put it on the table, wet the edge of the opening and lay a penny over it.

Hold both hands firmly around the bottle to warm it. After a few seconds, one edge of the coin will pop up and fall back with a little "plop!" This will be repeated several times.

What's happening here? The answer is that the air in the bottle, warmed by your hands, expands until some of it pushes out past the coin.

Convection takes place when heated air expands. Outdoors, this causes the winds. Expansion of heated air in the cylinders of an automobile engine drives the pistons down to produce power. In a jet engine, expanded air rushes out through an opening and drives the jet forward.

SCIENCE DIGEST

Twenty-seventh year of publication

This lean, handsome young man is one of the most important people in the world, the man behind our new nuclear power. See "Meet Johnny Foster." Photo: Dennis Galloway



SEPTEMBER • 1963

VOL. 54, NO. 3

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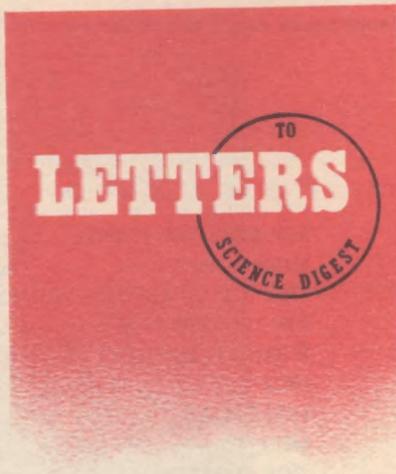
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ESP or pure chance?

Your report on ESP (extrasensory perception) (*What's on Your Mind?*, July '63) says that the Air Force has found that of 40 volunteers not one showed any signs of having ESP.

It seems you switched horses. At first you say ESP flunked the test, and that it is a result of pure chance. Later you state that the Air Force was just looking for a standardized test for ESP. Did ESP as a whole flunk the test or did 40 volunteers?

Who are you or the Air Force to say that ESP is false. Don't you realize that ESP is an extra-mental process that very few people possess? How can you or the Air Force refute the innumerable cases of ESP by simply passing them all off as chance or luck?

GARY WITT
Fairfield, Ill.

Everett F. Dagle, one of the authors of the Air Force ESP report has stressed that the idea that ESP "flunked" the test is an editorial con-

clusion and cannot be ascribed to the scientists who conducted the experiment. No single test can disprove (or prove) the existence of this phenomenon. However, in the tests the Air Force did conduct there were no results that could not be ascribed to pure chance.—EDITOR.

All possible methods

About the article, "The New Boom in Birth Control" (July '63), I say flatly that medical scientists, researchers, social workers, and other birth controllers should go ahead full speed to perfect all possible methods of birth control, including abortion techniques, and make all methods and materials available free or at low cost to everyone who wants them.

ANDREW VENA
Philadelphia, Penna.

Light slows down

Probably many others caught the error in your "The Brightest Things in the Universe" (July '63). It was such an easy error to make—and to spot after printing.

A light year is nearly six million million (trillion) miles, not six million.

J. F. ROTHERMEL, SR.
Dallas, Texas

Many others did spot our short light year.—EDITOR

Mumford's conclusions

I am afraid some readers may draw the wrong conclusions from Lewis Mumford's article, "Are We Selling Our Souls for Progress?" (July '63). I think our present troubles are due to democracy—the practice

of electing a king. In this way we have achieved a standard of equality in which the rich are so poor that they cannot support such things as opera companies, palaces, and charities. By discouraging exceptional people, we naturally discourage exceptional things. At the same time, we have achieved a standard of inequality in which the government is expected to tell the people what is good for them; that is, we have a boss.

Many people—Plato and Marx are well known—have designed ideal societies. Each is the product of a single mind, and as such can be characterized, like Sweden's social services, as incredibly efficient and incredibly dull. We are headed toward such a society because we have a boss. Most social critics want to be boss themselves; Mumford realizes that this does not solve the problem.

He goes too far, however, when he says we must "take everything offered." No one has forced me to take anything I did not want. We are



"Right now it's just a theory."

still a free people, and this is the key to the whole problem. To answer our President, all I can do for my country is to be myself, and all my country can do for me is allow it. If enough people agree, Mumford need not be so worried.

E. ALAN PHILLIPS
Princeton, N.J.

Crying shame

That "Florida family physician with a large pediatric practice" ("The Progress of Medicine," July '63) who doesn't want infants to cry at 2 a.m. just because they demand attention or the bottle will provide some future physician with a large psychiatric practice. These psychiatrists will devote hundreds of hours trying to get their patients to remember and to cry as they should have done when they were infants.

P. MEISEL
Chicago, Ill.

Dr. Walter W. Sackett, Jr., advised mothers to walk away from a crying baby after checking for wet diaper, open safety pin or other irritations.
—EDITOR

'A guest from the universe'

I have just finished a story entitled *A Guest from the Universe*. It involved the "Tunguska Catastrophe." In your November ('62) issue, you quote Soviet geophysicist A. V. Zolotov as saying, "We do not know but what on June 30, 1908, the earth collided with some very extraordinary still unfamiliar, but natural, heavenly body."

I'm not going to argue the point, but "*A Guest from the Universe*" says pieces of metal were found em-

bedded in the earth. Witnesses say a ball of fire turned into a mushroom-shaped cloud. Newspapers said witnesses died of a strange malady—like radiation sickness.

ERICK WICKSTROM
Glen Riddle, Penna.

A definite explanation of what happened in this remote area of Siberia in 1908 is still lacking. But let's not jump to any conclusions. We must remember there was no on-the-scene investigation of the catastrophe until 1921—13 years after the event! No pieces of metal were found, and witnesses in this sub-arctic area were both rare and unreliable.—EDITOR

Good work

I want to compliment you on your new "Science in the News" section. I enjoy it immensely, as I do your whole magazine. *Science Digest* is one of my favorites. Keep up the good work.

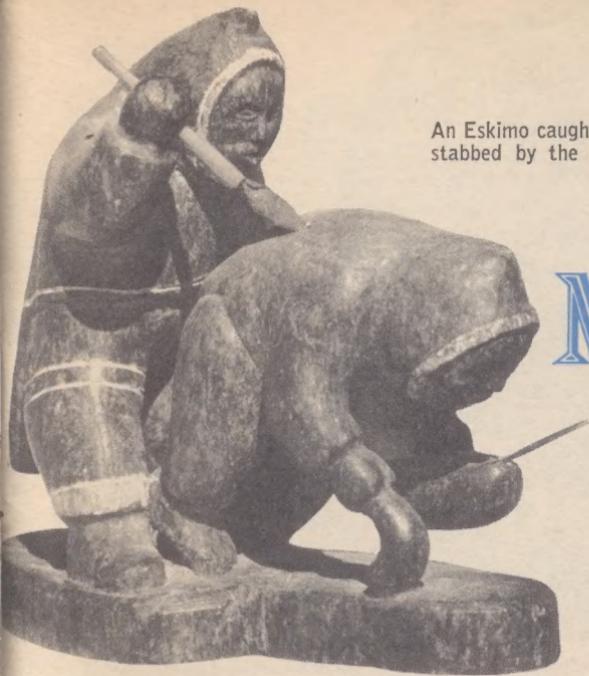
ALAN WALD
Sherman Oaks, Calif.

What good will it do?

Frequently I wonder whether placing a man on the moon is worth spending \$40 billion. Most scientists agree it is, some have said that a man on the moon could gather information that would tell us how the moon and earth were formed. What would this information contribute to mankind, other than satisfying our curiosity?

Some scientists think that placing a man on the moon is a step to landing men on other planets. But it is possible that it is not intended for people to go beyond their own planet?

F. J. OEHM
Port Orange, Fla.



An Eskimo caught stealing fish from a food cache is stabbed by the owner. (All photos Three Lions)

Murder in stone

A REMARKABLE collection of Eskimo soapstone carvings is owned by Justice John Howard Sissons, Chief Justice of the Northwest Territorial Court of northern Canada. They are carvings depicting actual murder cases he has tried.

Justice Sissons has one of the

largest, though not most populous jurisdictions in the world. It runs from the islands in Hudson Bay to the Yukon border, and its inhabitants include many Eskimos.

After a trial in which a young Eskimo boy was charged with helping his aged father commit suicide,

Strangling of one Eskimo by another (left) is one of the murders depicted in stone. Justice John Howard Sissons and his collection of carvings of important trials (right).





A graphic description in stone of the eternal triangle. A jealous husband tries to stab his unfaithful wife with a spear. The wife's lover uses his own spear on the husband.

an Eskimo woman presented Justice Sissons with a carving, showing exactly how the gun had been rigged. The Justice decided to have some of his later trials depicted this way.

Usually he commissions the best carver in the area to sculpt the event in soapstone.

One trial that was not recorded in stone was one in which a mounted policeman was killed by an escaping prisoner. "The Eskimos have too great a respect for the Royal Canadian Mounted Police to depict one of their own people doing such a deed," Justice Sissons says. "And I have too much respect for their feelings to ask them to carve it."

The life of the Eskimo is very different from that of the white man, but the circumstances and

An Eskimo wife, Kikkik, kills Ootuk, the murderer of her husband, Hallow, with a large dull knife.



passions that drive a man to murder are basically the same. Still, conducting trials in the Northwest Territories sometimes calls for unusual procedures.

The jury is often composed of only 6 men, instead of the 12 in more populous areas. The "Ekok-toege" (He who listens—the Eskimo name for judge) dispenses justice in the "spirit" not the "letter" of the law, with an understanding of the native people and their customs and traditions.

In an inheritance case, Justice Sissons created a precedent when he ruled that traditional Eskimo marriage (which requires only consent of the families)—though not accompanied by the white man's formalities—is legal.

When Angulalik was tried there were plenty of witnesses, as this carving shows, who could testify that he had acted in self-defense.



After being threatened by a drunk with a knife Angulalik draws his own knife and stabs his tormenter.





THE RISE OF RUSSIAN WOMEN

by Tamara Gilmore

The first spacewoman's flight shows that Russian women are different, one who married an American reports. Or are they?

As Valentina Vladimirovna Tereshkova carved out a shining new step on the way to the stars, millions of women everywhere—particularly underprivileged women—took fresh heart.

Her achievement advertised, in the greatest single piece of feminine sky-writing of all time, that the Space Age may have, at last, given women an opportunity of participating as equals in what is still very much a man's world.

Being Russian-born, I am tremen-

Tamara Gilmore (in recent photo left) has a daughter 19, another 13 and a third six.

dously proud of this blue-eyed, dimple-chinned, chubby-faced young woman of 26.

Just a little more than three years ago she was a textile worker in Yaroslav, 151 miles from Moscow. A fairly typical Soviet schoolgirl, Valentina actually got into space through a liking for parachute-jumping, a strange pastime one might think for a girl who constantly emphasizes how average she is. But parachuting is practiced on a national scale in the U.S.S.R.

Mixing with embryo engineers of both sexes at her week-end parachute jumps, she became fascinated by their science talk and enrolled at a technical night school.

In Russia, there are not the distractions to everyday life that one finds in the West. Very few individuals own automobiles, there is little individual sport such as golf and tennis, the cocktail party is unknown, and there is no such thing as the corner drug store, fraternities, sororities and school dances even for the teen-agers.

But—there are vast educational opportunities for all. It is free and in the case of particularly promising pupils, cash awards and regular financial help go with scholarships. With the Communist party and the government constantly pushing education, millions of young people who work in factories and offices attend

The world's first spacewoman, Valentina Tereshkova, is given a medical examination by a woman doctor during her pre-flight training. Russian women have entered and excel in many traditionally masculine fields.

Sovfoto



night schools. Viewed in the most cynical light, it gives them something to do, for life is fairly dull, compared with some other places.

As Soviet space agents combed the schools for promising pupils, Valentina Tereshkova received attention for she showed some unusual qualities as a parachute-jumper.

In the Soviet Union, women theoretically possess the same legal rights as men, equal pay, equal sick leave, equal vacations and they also get good maternity care. They receive two months off before and after the birth of a child and if there are complications, even more time off with pay.

In enjoying (if this is the word) equality with man, women are given some tough and arduous jobs.

They are steeplejacks, street-sweepers, carpenters, plumbers, truck, bus and taxi drivers, house painters, hod carriers, members of railway work gangs and road construction crews and on the nation's far-flung collective and state farms, they perform some of the hardest tasks.

Also—Soviet women are engineers, scientists, nuclear experts, technicians of all sorts, chemists, pathologists, physicists, doctors and I know of at least one woman who is the captain of a sea-going vessel.

The last census in the U.S.S.R. revealed there were 32 million women between the ages of 35 and 59, compared with only 20 million men

in the same age group. So—and I think this is extremely important in the consideration of women in Soviet science—women have had to tackle what is normally regarded as man's work simply because there have not been enough men to do it.

The lack of men is due, of course, to the staggering losses suffered in World War II, the terrible Civil War, and the first World War. In connection with the last war alone, I have seen the losses listed at 11 million and far, far higher.

Under the circumstances it is understandable how women have entered all the professions as well as all the occupations for they quite reasonably say to themselves (and indeed, I have had them say it to me):

"If I'm good enough to be a streetsweeper, then I'm good enough to be laboratory worker, and if I'm good enough to be a nurse, then I'm good enough to be a doctor, or even a professor."

Men run the country

In 1963, there are just about as many women with higher education as there are men.

In medicine, the percentage of women is a surprising 89. In science in general it is 67 percent.

But—and this is a very big but—women's representation in the best jobs is woefully small and when it comes to politics and running the country . . . well, it is embarrassing to all.

I am one of the most un-political

Tamara Gilmore is the wife of Eddy Gilmore, Associated Press foreign correspondent.



Sovfoto

The successful Russian woman doesn't look at all like the sleek image of the American "career girl." However, the importance of women to the work side of Soviet society cannot be doubted. Shown here are: (top left) Geophysicist Elizaveta Ryazanova, head of a seismograph research party to the Caucasus mountains, (above) M. Kolomiiitzeva, head of the hygiene faculty of the Altai Medical Institute and (left) G. Burkatskaya, deputy of the Supreme Soviet and Chairman of the Khrushchev Farm.

persons alive, yet in assessing woman's dominant numerical position in the professions and sciences in the U.S.S.R., I think we should remember that it is still the men who really run things and have the best of the good jobs.

There is not a single woman among the 14 members of the presidium of the central committee of

the Communist party, the highest political body in the nation.

Among the 155 members of the central committee itself, there are but four women.

In time, of course, more women will get into the more important jobs, but with the progress already made—and being Russian women—I seriously doubt if they are pres-



Tamara and Eddy Gilmore start trip to Russia earlier this year. They first met in Moscow during World War II.

ently discontented or envious at the comparative lowly rank. In the Soviet Union, women are not rampaging feminists.

I should imagine that every Russian woman thrilled at Valentina Tereshkova's orbiting of the earth, singing as she did it, but she went through her own private hell while she was doing it and when she was preparing to be the first astronette.

Unfeminine routine

Russian women are extremely feminine and Valentina had to go through a number of very unfeminine things.

Wearing three space suits, she did a lot of perspiring. They stuck wires under her skin and distributed thermometers around her body in a way that would make a lot of women blush.

As she swung through space I am

certain she wanted a bath, but the best she could do was to open her helmet visor and dab at her lips and cheeks with a wet cloth.

In preparation for her flight, she endured many months of severe physical training.

For hours she was tossed around like a table tennis ball in a washing machine.

She lived for long stretches on a special spaceman's diet which could not have been too tasty.

She sat in steamy isolation in a compression chamber for long hours so the experts could see how much punishment a woman could stand.

Valentina Tereshkova went through a mental grilling that would have sent many a strong man up the wall.

Yet, throughout her terrible ordeal, she remained feminine. She showed this when she dried up and then blubbered when she was being welcomed to Moscow by Premier Nikita S. Khrushchev.

Along with their equality with men in executing all sorts of jobs, the Russian women have remained essentially feminine and always modest. At home, they are almost unbelievably meek.

They may work in factories, hospitals, on railways, at space projects, or even in the Kremlin as secretaries and stenographers, but they take their earnings home and spend most of it on their children, their parents and their husbands.

Most Russian women do not smoke in public. An increasing number drink wine, but not many

of them go in for vodka or cognac, the country's two strongest drinks.

Seldom will you see a Russian woman enter a bar unaccompanied, and in conversation, she will nearly always give way to a man.

Russian women glory in the space successes of their country, but I seriously wonder if down deep in their hearts there is not a feeling that it would all go a great deal better if so much time, effort and money were not exerted in other directions.

Sad about space flight

Until I met and married an American in Moscow in the early years of the last war, I imagine that I was just about as typically Russian as is Valentina Tereshkova. Although I have been living in the West with my husband and our three children for the last ten years, I think I still retain a number of my Slav emotions, feelings, sentiments and reactions to things, events and people.

Although I am now a naturalized American, I was proud, but unexplainably sad the day that Yuri Gagarin became the world's first spaceman.

It was difficult for me to explain my sadness to myself, but the American writer, the late James Thurber did it for me.

It was on his last trip to London and it was the last time I saw him. He was in London with his charming wife, Helen, and when the Thurbers were in town we often dined together. This particular evening

we were at the Thurbers' hotel and Jamie was sad. Not sad because a Russian instead of an American had pioneered the way into space, although I am quite sure that if someone had to make the initial flight, Thurber would have preferred him to be a fellow citizen of the United States.

We had just sat down to dinner when Thurber said:

"This is a very dark day for the world."

"Dark, Jamie?" asked someone. "Why? Gagarin has opened up a whole new world. We stand on the threshold of the greatest period in history."

Tamara Gilmore at a ballet class in Moscow in 1947. For the past 10 years she has lived almost exclusively in the West.



"Dark," he repeated, "for the plain and simple reason that if the human race can't solve even one-tenth of its problems on earth, then what the hell are we doing in trying to take on some more up there?"

That was precisely how I felt.

Now, I do not mean to say that I think many Russian women feel sad about Valya Tereshkova's stupendous performance. On the contrary, they are delighted.

But, I do have the feeling that many Russian women—down in their souls—would rather leave the space business to the men.

After all, the Moscow and Leningrad housewife is only just now getting accustomed to her new electric stove, and both cities had a spate of fires recently because Maria Ivan-

ovna up to now is still not quite sure when to switch off her super cooking gadget.

As a Russian-born woman I cannot help but feeling that as more Soviet women take the road to the stars—and more of them will do it—someone must still do the dishes, and it will be the woman who does them.

What will be the effect of Valentina's flight on American women?

Did we not invent togetherness?

Is it not most logical that the United States will soon have His and Hers spaceships in orbit at the same time?

And, when that time comes, one thing is certain—the first American astronette will have the most beautiful pair of legs in space.

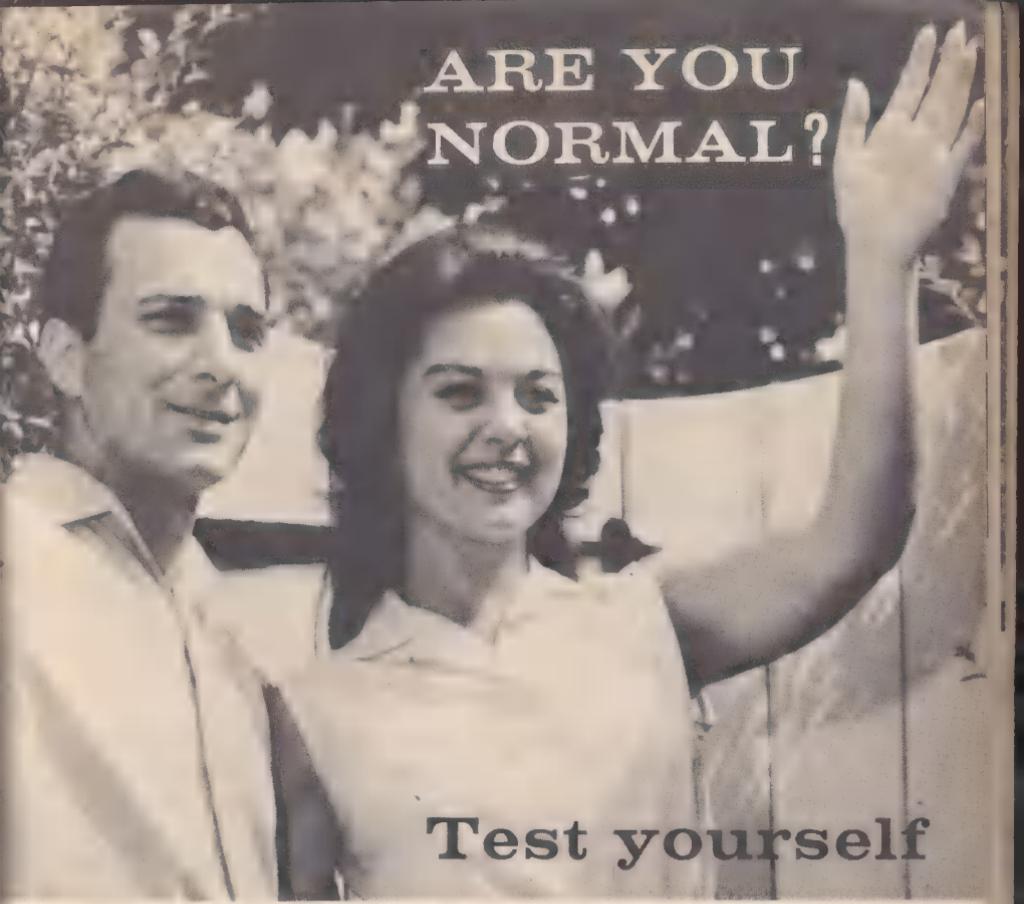


Riding a comet

SCIENTISTS want to explore the moon because it is a well-preserved fossil from the days when the solar system was being formed. Now scientists are suggesting comets may be even more perfect relics and that it is time to climb aboard and look around.

"Comets in a sense were put into a deep freeze," says Dr. Bertran Donn, astronomer at Goddard Space Flight Center. Taking a good look at them "may answer certain questions about the way planets were formed and large celestial objects accreted (grew)," Dr. Donn believes.

The largest comet ever measured had a tail longer than the distance from here to the sun and a head one and a half times the diameter of the sun. Inside the head of a comet is a nucleus of ice estimated to be a few miles to a few hundred miles in diameter. Deep within, Harvard astronomer Dr. Fred Whipple predicts "cores of the nucleus . . . stratified like geological sedimentary strata, (which) should give the oldest and least disturbed material record of ancient processes." That is why we want to land a space probe on the nucleus of a comet. A recent study made for the National Aeronautics and Space Administration concluded that a probe through a comet is presently practical, and went on to outline requirements for reaching the comet Encke when it approaches within 24 million miles of the earth next July 13.



ARE YOU NORMAL?

Test yourself

Do you consider yourself normal?

Defining the state of "normalcy" has always been difficult for psychologists. But recently a group of researchers at the Albany Medical Center, Albany, N. Y., published the results of a long-term study of "normal" men and women. The Albany group feels that their study has given them a description of the "normal" American man and his wife.

The study also indicates that precious few people fill the bill of "normalcy."

The origins of the study date back more than a decade when an objective test of psychiatric status was given to 1,953 teen age boys in the Minnesota public school system. The test is called the Minnesota Multiphasic Personality Inventory (MMPI). The MMPI is not structured to find the "average" psychological state among those tested. It contains 550 different items covering a wide variety of categories, and aims at discovering any of a large number of psychiatric disorders, many of which may be quite minor.

The standard for "absolute normalcy" is so stiff that, of the 1,953 boys who were tested, only 73 gave no indication of significant pathology, according to the psychologists who gave the test. The study was undertaken to give psychologists a "baseline description of the normal American male" and a reference group for comparison purposes.

Several years ago, Dr. Jules Golden, associate professor of psychiatry at Albany Medical College, and his associates retested 50 of the original 73 boys (age 26-27 at the time of retesting) and did a comprehensive study of each of them.

Then this year, the Albany team

finished a study of 38 wives of the 40 men who were married at the time of the followup study (two wives weren't available). As in the case of their husbands, the wives were interviewed, their marital status discussed, their homes visited, and their social adjustment measured. All also took the MMPI.

To accurately rate the normalcy of any individual or couple would take a trained interviewer and a battery of tests. But if you want to rate yourself against what the Albany researchers discovered about "normal" American couples, you may get a fair idea from your answers to the following questions:

For couples

Were you married in a conventional religious ceremony?

Of the 38 couples studied, 35 had conventional religious ceremonies and three were married by a Justice of the Peace.

Have you ever been divorced or separated even temporarily on the basis of incompatibility?

Significantly, the study found that none of the individuals had ever been divorced or had even a temporary separation.

Is there any conflict over religion in your home?

Twenty-seven of the couples had no religious difference or conflict over religion. There was a difference of religion in six of the marriages, but

it was reported that this created no conflict. In five, a difference was a basis for mild contention.

Are you both about the same age?

It was found in the study that 16 of the wives were within one year of the age of their husbands, 15 were one to five years younger, and only five wives within one year older than their husbands. There was one that was more than five years older and one that was more than five years younger.

Who is the dominant one in your family?

Nineteen of the husbands appeared somewhat dominant (for example, in making decisions), and four were markedly domineering. In nine cases, neither wife nor husband dominated.

In only six cases did the wives give evidence of dominance, and of these, in only two instances was it marked. The stereotype of "Momism" does not seem to apply to these couples.

Are you satisfied with your life?

The study showed that both men and women were essentially content with their lot in life. The women seemed to have even less of a desire to move up socially than the men. In the estimation of the psychologists, the women's aspirations appear to be in keeping with what they can realistically anticipate in their lifetimes.

What would you do if given five million dollars?

When this question was asked of the "normal" men and their wives, a very few indicated they would make any significant changes in their way of life. Typical responses were that they would buy a new house or a new car. In general, the psychiatrists felt these individuals displayed little imagination in responding to the question.

A control group of people who had been juvenile delinquents showed more imagination. One said he had never thought of receiving more than a million dollars, and that he would underwrite a municipal golf course, a city museum, a hospital for crippled children. He also said he would employ a French chef and buy a Rolls-Royce. He concluded by asking, "Doc, could you up the ante to ten million?"

For husbands only

Are you a member of the "middle class"?

Most of the men studied were in their mid-twenties and held average white-collar jobs. Only one was in the \$10,000 to \$14,000 income bracket.

Have you moved to a different city recently?

Despite a lot of mobility in America today, the stability of the men in this "normal" group was remarkable. Of the original 73 high school students with normal scores, 50 of them were in the same metropolitan area 12 years later when the follow-up study was made.

Would other men consider your wife attractive?

This is a tough one to answer objectively, but in the opinion of the examiners 15 of the group of 38 wives rated above average in physical attractiveness; none was considered below average.

Have you been faithful to your wife?

Of the husbands studied, only one revealed sexual promiscuity and two others, a rare transgression.

For wives only

Did you have your parents' consent when you married?

Thirty-six of the 38 wives studied were married with full parental consent.

Are you moody?

Thirty of the wives showed no unusual mental symptoms at all. Three others had uneven or unpredictable moods and were classified by the psychologists as emotionally unstable. Three additional wives suffered some other minor symptoms and two had some obvious mental disorder. The two wives with mental disorders, however, were married to highly adaptable and devoted men, and the investigator did not foresee any critical marriage problems for them.

Did you have any sexual experience before you were married?

Twenty-seven wives reported no sexual experience prior to marriage, six had had relations with their husbands during courtship, three reported other relationships (but not promiscuity), and two wouldn't discuss the topic.

Do you have confidence in your husband's fidelity?

All wives asked expressed their complete confidence in their husbands' fidelity.

Are your children "well adjusted"?

The vast majority of the children of these couples gave every evidence of an emotionally healthy adjustment. In one family, three children were found to be severely disturbed, and in only three other families was there found to be one mildly disturbed child.

Conclusions:

The findings of the Albany study support the theory that "like marries like." Based on the test scores, the wives seem to be even more "normal" than their spouses.

The investigators commented that these young couples "experience what we consider some of life's deepest and most meaningful pleasures in their stable relationships with each other, and in raising their children."

But there is a price for all this stability. "The inference could be made," the investigators point out, "that constricted interests permit such subjects a wider opportunity for the meaningful rewards of family life." In short, the lives of these "normal" couples were dull and mundane, they lacked imagination and a wide range of interests.

Although a large percentage of such couples in the population would promote stability and a firm backbone for the country, the investigators stated, "We do wish to express our mixed feelings about this adjustment.

"A more stimulating educational experience and more enlightened media of mass communication, it is our hope, will enrich such 'normal' people's lives without sacrificing their essentially sound adjustment."



THE PRAIRIE DOG has been found to be the first animal, other than man, to develop both gallstones and atherosclerosis.



When an elephant sleeps

by John Sidney

If you have trouble sleeping, then you should be able to sympathize with some of the problems animals have to put up with.

AN elephant owned by Louis XIV of France did not lie down for five years. He slept on his feet and supported his head by thrusting his tusks into two holes he had worn in the stone floor of his enclosure.

Louis' elephant was one of the wonders of the time and the source of much speculation among naturalists.

A probable explanation is that the elephant slept on his feet because

he had no other elephant with which to share sentry duty.

Both in the wild state and in captivity, bull elephants post sentries. Some always stay on their feet, dozing, while their companions stretch out on the ground. In one big American circus with 35 bull elephants, five were always on guard as the others slept.

At intervals of about half an hour, two of the sentries would

settle on the ground to take a nap. Their place immediately would be taken by two others.

It is a wise precaution for the elephants to have some of the herd on their feet to meet possible danger. A recumbent elephant takes a long time to get up.

Elephants apparently are able to get most of the sleep they need by dozing while standing. They lie down for as little as one and a half to four hours in every 24. The time for the nap varies from night to night.

The sleeping problems of elephants—and the fitful slumber of Louis XIV's elephant—highlight the fact that animals, like men, need sleep, but cannot always achieve it as comfortably as we do.

Perching birds, for instance, have to sleep on their feet. Have you ever wondered why they don't fall from the perch?

The answer is that they can't. A bird has a long tendon attached to

the cords which move its toes. The tendon, nearly as long as the bird's leg, is attached to a large thigh muscle. When the bird sits on a limb, the knee and ankle bend and tighten the tendon. The tendon contracts the toes and, in effect, locks the bird on the perch.

The mechanism is so effective that birds which have died in their sleep often have been found upright, the toes firmly clamped around the perch.

Many birds sleep with their head tucked under a wing and with the feathers fluffed up as an insulation against the cold. Herons and cranes sometimes slumber standing on one leg.

An original note is struck by the bat parakeet of South America, which sleeps with the head hanging down, and clinging to the perch with one foot. Some swifts go in for togetherness—they sleep clinging together in a great ball.

Sleep involves special problems

In the jungle, gorillas will go to great trouble to prepare beds of sticks and leaves.



Ducks sleep so soundly on the water that they have been trapped in the ice by a cold snap which has overtaken them.

for birds. Their metabolism is very high; they live at what would be fever heat in ourselves; their normal temperatures are around 108° F.

They could never live through the night at such a rate, so nature slows down the bodily chemical processes and their temperature drops very sharply to 68°.

Many water birds sleep while floating. Ducks and swans have been trapped in ice by a cold snap which has overtaken them while they slept.

Gulls sleep on the water. It is claimed they also take brief cat naps on the wing—an ability also attributed to some long-ranging sea birds such as albatrosses. They may well do so, but albatrosses frequently alight on the waves to feed and doubtlessly they do most of their sleeping on the surface of the sea.

Some animals, too, are able to sleep on water. A zoologist, R. M. Lockley, has given a graphic account of the sleeping habits of brown seals he studied in an aquarium in Germany.

He saw a pair of brown seals sink slowly to the bottom of the six-foot-deep tank. The female closed her eyes and was shortly fast asleep.

The male then rose to the surface and began to doze. His eyes closed and he began to sink slowly. While this was happening, Lockley saw the cow lifting herself with a scarcely perceptible flicker of her tail and foreflippers.

"Her eyes were fast shut when she breached the surface and began to blow audibly," said Lockley. "After some 16 deep breaths she closed her nostrils and sank again to the floor. Her eyes had been closed throughout this breathing interval of about one minute and there is not the slightest doubt in my mind but that she was fast asleep throughout.

"She sank and remained for five and a quarter minutes before rising and breathing 12 times again, and still without opening her eyes."

The bull, meanwhile, was acting in the same fashion. The two seals continued to sleep for half an hour, rising and falling through the water, until a loud noise disturbed them.

Comfort-loving apes

Only the higher apes seek comfort as we know it, and spend much time in bed-making. (Bed-making, among many other animals, your pet dog, for example goes no farther than smoothing a small space and curling up in it.)

Gorillas go to great trouble to prepare beds of sticks and leaves.

A gorilla family toward evening will select a spot in the forest with a canopy of vines.

The gorillas bend young branches together and interweave them into a springy platform. On it they place sticks and leaves as a mattress on which to sleep in comfort.

Orang-utans usually make beds in treetops. Unlike the gorillas, they favor single beds. An orangutan will choose a fork surrounded by heavy foliage. He breaks off leafy branches and wedges them in the fork. Like the gorillas, he has an eye for comfort and the broken ends are carefully placed outward.

When completed, the bed is 4 feet to 5 feet in diameter and has a level surface.

Many sleeping animals make sounds and movements which appear to show they are dreaming—and not always happily. Elephants seem to suffer from nightmares, during which they trumpet noisily. They also snore loudly.

Insects, too, must rest, but what we call sleep in insects probably more closely resembles the somnambulistic state. This was the observation of the famous naturalist, W. H. Hudson, who discovered that when a sleeping butterfly was picked

off a blade of grass and then put back again, the feet would clasp the blade.

If a snoozing butterfly is lifted away from its grass blade and tossed into the air, it glides down with fixed wings. When it touches anything it clings to it automatically.

The many species of wasps have varying techniques. Some sleep in clusters. Others sleep singly, choosing a flower throat, or a leaf. One species chooses a crevice in a stone and curls up inside, sleeping on the back.

An ant yawns

Even busy ants sleep. Sir Julian Huxley has given this account of how some ants sleep:

"They may choose a depression on the soil as a bed, and there lay themselves down, with legs drawn close to the body.

"When waking (after some three hours' rest) they behave in a way startlingly like that of our proud human selves.

"The head and then the six legs are stretched to their full extent, and then often shaken. The jaws are strained open in a way remarkably reminiscent of a yawn."

FRENCH scientists may use ants as living Geiger counters. It all started two years ago, when the scientists found that anthills were hotspots of radioactivity. Tests on a ball of one million ants weighing almost two pounds pointed to the ants themselves as the source. The phenomenon was due partly to what ants eat, insect experts figure. Ants love the sweet honeydew excreted by the tree aphid. The diet gives them a charge because a coat of dust and fallout is on every sticky drop.



SURGERY

1860

A H, THE good old days! Good in some ways perhaps, but not if you were sick.

During its recent 27th anniversary celebration, the Lehigh Valley Blue Cross and Blue Shield of northeastern Pennsylvania dug up some of the oldest hospital photos in the United States.

From Pennsylvania Hospital in Philadelphia they obtained what is perhaps the oldest operating room photograph in existence (above).

The surgeon looked more like Teddy Roosevelt than Ben Casey. He wore no gloves and operated in street clothes and highly polished shoes.

The photographs show dramatically how far medicine has advanced.

About 50 percent of today's drugs were unknown in 1950.

The first successful heart operation was not performed until 1896.

And it was not until the beginning of the 20th Century that Karl Lansteiner divided blood into groups and made transfusions safe.

Earlier a doctor by the name of Semmelweis was laughed at because he asked surgeons to wash their hands before operating, and Lister was ridiculed because none of his patients had the "good clean smell of pus" about them.

MEET JOHNNY FOSTER

by Daniel M. Wilkes

This Hollywood-handsome young man is a championship ski jumper and an Olympic-class gymnast. He also heads the remarkable Livermore Radiation Laboratory and is the man behind America's new atomic power.

JOHN S. FOSTER, although not widely known to the public, is one of the world's most important men.

There are good reasons.

His unusual mind is well furnished with sophisticated training and experience in the manipulation of nuclear energy—for either military defense or large-scale peaceful work.

At his disposal are the tools with which to do both.

His almost unlimited energy, enthusiasm and imagination are harnessed to a well-directed dedication.

Above all, he is the astute, hell-for-leather leader of a corps of young men very much like him.

Johnny Foster—everyone calls him Johnny—is the director of the University of California's Lawrence Radiation Laboratory branch at Livermore, which celebrates its 11th

anniversary on September 2. (The site of the original Lawrence lab is at Berkeley.)

Foster, his predecessors and their associates have already had a big impact on the world.

By their major contributions to the diversification and modernization of the American nuclear weapons arsenal, they have helped maintain a favorable balance of power for the U.S. and the free world.

They have also generated significant progress in the development of designs for using nuclear energy to extend the world's resources and expand man's achievements.

The mold for Livermore and a tradition of "Johnnys" to head it was shaped by the late Ernest O. Lawrence.

In his 30 years at Berkeley, Lawrence invented the cyclotron, won the Nobel Prize, played a major role in mobilizing America's nuclear

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Pensive Johnny Foster presides over morning staff conference at Livermore Lab.





Informality is the keynote when Johnny directs a conference. No matter how tough the problem he is always friendly, enthusiastic, humorous and only mildly profane.

effort in World War II, and became a leading statesman of science. To him the word "impossible" was only a challenge when the objective was important.

The Lawrence spirit was infectious for the young men who gathered around him. The Berkeley laboratory he founded became the foremost experimental physics center of the world.

The idea of founding a Livermore branch took shape early in the 1950's when it became clear that the Russians were on their way to developing an advanced nuclear weapons capability. The Atomic Energy Commission asked the Regents of the University of California and the late Professor Lawrence to form a weapons laboratory. The original and only other nuclear weapons laboratory—Los Alamos Scientific Laboratory—had been organized in 1943.

Daniel M. Wilkes is a science writer and assistant to the director of the Lawrence Radiation Laboratory.

When the atomic young Turks went to Livermore in 1952, their charter was simple: Break some new ground; try some new ideas; go for the high, hard ones.

As Johnny puts it: "Take a big enough step so that things get a little radical. Don't look so far ahead that you really don't know what you are talking about. But don't look so close in the future that you are just putting existing pieces together."

They started badly. In the first couple of years, they had some failures in weapons tests at Nevada and in the Pacific. Things had gotten too radical. They went back to their homework. They became experts. Soon their designs began to work.

Virtually all of the weapons work at Livermore is classified. But one of its most important achievements has been revealed.

On December 1, 1960, when the Navy Department made public Livermore's work on the Polaris missile system, the Laboratory received the organizational Navy Certificate



But behind the affability is a demanding undertone. "Well, what did he want, the impossible?" an associate of Johnny was asked. "Yes, and a little extra," was the reply.

of Merit for developing the nuclear warhead.

Johnny Foster is almost Hollywood handsome—fair haired, blue-eyed, tanned, liberally muscled, a trim-waisted natural athlete. His whole background suits him for action. He likes to see something on the near horizon.

Over the fence

Once he visualizes a realistic objective, he makes a bee-line for it—hang the red tape, the usual delays and "buts." A fellow-student remembers when Johnny, then a Berkeley graduate student, was on his way to his laboratory, which was engaged in classified work and situated behind a security fence. He had to walk some distance around the fence to the guarded entry. Impatiently, he easily vaulted the fence and made a bee-line for his laboratory. The guard spotted him and turned him in. An indulgent and understanding Ernest Lawrence bailed him out of his peccadillo.

Foster was born September 18, 1922, in New Haven, Connecticut, the son of John Stuart Foster, a famous physicist. The elder Foster transferred from Yale to McGill, in Montreal, and young Johnny spent most of his youth in Canada. As an undergraduate at McGill, he became a championship ski jumper. He made the Canadian Olympic gymnast team, but a shortage of funds canceled the trip to the games.

World War II interrupted his studies at McGill when he was still a sophomore. Johnny wanted to become a fighter pilot, but his father, who had gone to M.I.T. to work on radar, shanghaied his son onto a Harvard team to work on radar countermeasures. After helping to develop a new high-frequency radar receiver, he accompanied countermeasure equipment to Italy in 1943 as a civilian consultant to the 15th Air Force. He talked crews into taking him on missions—against regulations. His observations convinced him the crews were so misusing the equipment that they



Livermore directors, past and present, are, from left to right: Herbert York, Harold Brown, Edward Teller, Edwin McMillan, Foster and Kenneth Street.

might as well have left it at home.

Driving himself in characteristic fashion, Johnny visited every bomber base in Italy, briefing bomber crews on enemy radar tactics and how to use the new equipment. Immediately after the war's end, he flew into a base still held by the German air force. Luftwaffe officers acknowledge that the switch in American bomber tactics in Italy had made radar tracking tougher.

The lesson to Johnny had stuck: There is a big gap between the laboratory and the field, and technical men have to help the military understand the need for changes in tactics to make best use of a new weapon.

While at McGill, Johnny married Barbara Anne Wickes, a teen-age girl friend, and she worked as a

secretary to help him through. The elder Foster was a friend of the late Dr. Lawrence, and Johnny was persuaded to go to Berkeley for his graduate work. Johnny sped west on a motorcycle, with Bobbie on the seat behind. In Berkeley, Mrs. Foster worked as an X-ray technician while Johnny, under Dr. Luis Alvarez and Dr. Lawrence, won his Ph.D. in research on ion sources and high vacuum ion pumping.

Mrs. Foster today keeps pace with Johnny on the ski slopes, in the swimming pool and on the golf course. They have four children: Susan, 12; Bruce, 11; Scott, 10, and Ian, 5.

The Fosters live in a house Johnny helped design. Located on the grounds of the Castlewood Country Club Course, it is topped

by a floating roof, has a private swimming pool, and commands a wide sweep of Amador Valley.

His day begins near dawn. On many a morning, he is up at 6:30 and either stroking smoothly across the pool or out playing a few holes of golf. "I find I have to get some exercise to stay relaxed." Mrs. Foster has breakfast ready when he comes in from his workout.

Off with the coat

He gets to the laboratory—a sprawling utilitarian mixture of old frame barracks, no-nonsense modern buildings, and a variety of windowless concrete structures—before 8:00. Between his car and his office, he peels off his coat. By the time he sits down he has his collar unbuttoned, his tie pulled loose, and his shirt sleeves rolled up—the uniform of the day for Foster.

In his spacious office, he sits at the head of a long walnut conference table—he abandoned a desk some time back. By 8:15, Duane Sewell, a steady, science-wise right-hand man of Livermore directors since the early days, and the leaders of the various research programs have arrived to thrash out the day's problems.

There is no agenda. A tone of affability and good humor is always present, however, through the problems. In conference, Foster is friendly, enthusiastic, humorous and only mildly profane. Withal, there is a demanding undertone. He quickly cuts through to the heart

of a problem. Frequent questions are "What are the most important objectives?" "Who could do it well?" Inevitably, he wants the most a man can give.

Dr. Charles McDonald, senior physicist in the weapons program, upon emerging with the usual shook-up look from one of these conferences, was asked: "Well, what did he want, the impossible?" "Yes, and a little extra," McDonald replied, laughing. Long a Foster admirer, McDonald says: "After you have convinced yourself you can't climb a wall, Johnny tells you you can. Pretty soon you begin to think you ought to. Then you convince yourself you can do it, and you're on your way to getting over."

Another colleague, Dr. Al Kirschbaum, leader of the neutronics division, calls Foster a master of the stick-and-carrot technique. "So many people who try it," says Kirschbaum, "drop the carrot, and all they have left is the stick. Johnny never forgets the carrot."

Sprawling Livermore conducts some of the country's most important nuclear work.





Many mornings before going to work Johnny is out playing a few holes of golf on the course near his home. "I find I have to get some exercise to stay relaxed," he says.

When the morning conference is over, the day falls apart. "We maintain the open-door policy," says Chet Frankhauser, Foster's able executive assistant. "Almost anybody in the lab can get in to see him most any time when he's here."

When he tires of the interminable paper work, Foster may "get lost." That means he's roaming the laboratory, dropping in on this or that research group or shop, questioning in his incisive but friendly manner, exuding enthusiasm and encouragement. During the day he may see any of a variety of VIP's: Congressmen, AEC Commissioners, advisory group members, Regents, defense and military officials, visiting scientists, and others. Trips may take him to Washington, Europe, and the Pacific Proving Grounds.

Johnny started at Livermore in 1952, working, not on weapons, but on Project Sherwood—the first of several broad-ranging peaceful counterbalances to the laboratory's weapons work. But weapons design suited the young scientist's urge to contribute to national security, and

in 1953 he made the switch. "One of his inventions was the 'Johnny'—a 24-hour day jammed into 16 hours," comments one observer.

As a normal long day neared an end, Johnny would say, "Let's come back tonight and try some things." Work at any time of day or night is routine at Livermore. The computers work around the clock. Stores and equipment are always available for scientists who want to "try some things"—which often occurs after hours.

A newcomer from a well-defined organization or a government agency tears his hair at the organizational system at Livermore. "We don't have a formal system of channels or chains of command," Johnny volunteers, "but we're strong on who is responsible for getting what jobs done."

The results of having a policy of very little policy speak for themselves in the innovations coming from Livermore.

One of the most imaginative and challenging peaceful uses of atomic energy is wrapped up in the concept



One of Johnny's four children, Bruce, 11, shares his father's interest in golf. His other children are Susan, 12, Scott, 10, and Ian, 5.

of Project Plowshare, a Livermore original. The idea for turning the nuclear sword into a plowshare.

Plowshare involves the use of nuclear explosives for a wide variety of work—"geographical engineering" Edward Teller calls it. It embraces the concept of massive excavation, inexpensive mining of marginal mineral deposits, cutting canals, generating power in underground caverns, mass production of radioisotopes, using atomic power to do jobs that are now impossible.

No one knows now what the future holds for Plowshare. The carving of new harbors? Slicing a new Panama Canal through Central America? It seems likely that big jobs that man cannot now do or that can be done more cheaply and quickly with nuclear explosives, will become a reality through Plowshare.

Livermore's young Turks are a wide-ranging crew. They commute regularly from Livermore to the Laboratory's test site at Mercury, Nevada. They are regularly to be found in Alaska, New Mexico, Louisi-

siana, Hawaii. They make appearances in Australia, the United Kingdom and Geneva, as advisers and consultants, and on Laboratory projects.

In a letter commending Livermore on its 10th Birthday, President Kennedy had this to say: "The Lawrence Radiation Laboratory at Livermore, California, has made many substantial national contributions and the advances brought about by the Laboratory's efforts have been highly significant. . . . The success of the Livermore Laboratory is, of course, a measure of the outstanding men and women associated with its work It is, therefore, with pleasure that I extend my personal congratulations and those of our country to the Lawrence Radiation Laboratory at Livermore on its 10th anniversary."

The air at Livermore is electric with excitement and adventure. Johnny Foster figures that his responsibility is to keep it that way—maintaining the "far out" stance necessary for free world defense and human welfare.



'Our smallest baby'

"**O**ssy was our smallest baby." So writes Barbara Harrison, of the baby ape above, in a new book, *Orang-Utan* (Doubleday, Garden City, \$4.50).

Mrs. Harrison played substitute mother to an ever-expanding group of baby orang-utans found deserted in the Borneo jungle.

Barbara Harrison and her husband Tom have lived for years in Borneo, where he is a science writer and the director of the Sarawak Museum.

Orangs grow into some of the largest apes in the world, so you might think that even as babies they would be independent, perhaps fierce. Not so. They are affectionate, though demanding, charges.

Mrs. Harrison writes some of her problems as though they were drawn from the case book of a foundling hospital's director:

"Ossy completely adopted me as his new mother within twenty-four hours. And I told Joan over the telephone that, in my view, it was much better for her to stay away. I felt that a clean break helped him to accept the change better. . . : I knew that one day I would have to hand him over in just the same way."

The book ends with a plea for developing better ways of keeping this remarkably charming animal in captivity—since this may be the only way for the orang to survive in the modern world.—D.C.

How religion influences your politics



REILIGION may be the best guide to a person's political opinions.

Dr. Peter I. Rose of the sociology and anthropology department, Smith College, Northampton, Mass., found that Catholics have the most extreme views on politics.

Compared to other religious groups, they are more strongly anti-Castro, anti-Soviet and anti-Communist. They strongly favor building fallout shelters and are most leary of disarmament.

Protestants, Jews, Unitarians and atheists, in that order, hold views which are decreasingly rigid.



Political affiliation, Dr. Rose found, is really a poor indicator of policy views. Catholics and Jews who call themselves Democrats have vastly different views on international affairs.

Dr. Rose studied 1,320 students in colleges in western Massachusetts. He found the Catholics have a lower information level and find it easier to hold strongly to a single point of view.

The better informed, on the other hand, are more confused, he found. Seeing all sides of an issue, they are less likely to view the world in terms of black and white.

Which chaps will go wrong?

The British have been having a lot of trouble with the private lives of their public officials.

Shortly before the now notorious Profumo case burst wide open, William Vassall, a clerk in the Admiralty, was convicted of selling state secrets to the Russians. Vassall was vulnerable because he was a homosexual.

David Yorwerth Davis, assistant editor of the British publication, *New Scientist*, has looked into the methods that could be employed in selecting people who are to be entrusted with official secrets.

"A spokesman for one of the Government departments told me," Davies writes, "that while he could not really discuss screening methods, selection of personnel was conducted 'by chaps who know how to handle chaps . . . generally ex-army or ex-police officers. . . .'"

However, Harold Watkinson, a former Minister of Defense said that before a man was sent to the British Embassy in Moscow (where Vassall was persuaded into treason), that man was checked "by electronic means and by any other means. . . . You're given the full treatment, and you're checked to see if you're a homosexual. . . ."

"An interview with 'a chap who knew how to handle chaps' would no doubt reveal whether the candidate would prove socially acceptable in an embassy," Davies comments.



"An interview with a trained psychologist would reveal considerably more. A psychologist or, better still, a practicing psychiatrist could detect quite rapidly any sexual anomaly simply by the process of question and answer and by observing the candidates visually observable reaction to the questions."

There are also standard or personality tests, which Davies says

give remarkably accurate information about the sort of person a candidate is.

A combination of interview and questionnaire should reveal latent homosexuality, although tendencies to drunkenness, promiscuity or extravagance might be more difficult to find, Davies pointed out.

Further investigation using "word association" and Rorschach tests would help to enlarge the picture. And, Davies feels the lie detector would also be useful.

Here, however, one comes to some basic questions. "The ultimate in scientific methods are capable of error," Davies says. "Even if they do not result in mistakes, they may simply reveal that the candidate has 'something' hidden—and that may be only a dream of a girl he never knew. Is this possibility of error or unjustified suspicion tolerable? And secondly, are such methods tolerable in their intrusion into individual's privacy?"

You can't scare a bad driver

Safety education films "with a large gore ingredient," just don't scare motorists into being better drivers. After watching these films people went out and drove just about the same way as before," reports Dr. James L. Malfetti of Columbia University.

The University, working under a grant from the American Automobile Association Foundation of Traffic Safety and the United States Public Health Service is exploring

projects which have a potential for reducing traffic accidents.

A research team that dealt with establishing motorists' behavior patterns was critical of the undue reliance placed on instruments for measuring drivers' habits.

"It would be far superior for enforcement officials to get on the road themselves and see just what a driver does that might cause mishaps," they declared.



They pointed to radar speed-measuring devices that merely showed how fast a motorist was moving without being able to judge how well he was driving.

Driver improvement courses, on the other hand, were almost always effective, no matter what techniques were used.

The principal thing, Dr. Malfetti said, is that the "bad driver" often becomes a better driver because he knows someone is concerned about him as an individual—not just as somebody to be punished.

What alcohol means to man

"Alcohol affects thinking processes and emotions. . . . Its use has been associated, correctly or not, with almost every type of human problem. Studies of alcohol and

drinking offer a fine vantage point from which to observe human conduct."

So speaks Dr. Seldon D. Bacon, director of Rutgers Center of Alcohol Studies, New Brunswick, N.J. He points out that drinking alcoholic beverages has been part of the social life of almost every human culture.

"You can study almost every social problem both with and without the alcohol component," he says, "and as you learn about alcohol problems, you inevitably learn about social patterns in general."

The Alcohol Center is a research organization which uses the social, psychological, and biological sciences to study alcohol and its effects.

"One of the research areas with which we are becoming increasingly concerned," Dr. Bacon says, "is the problem of how information is communicated. For example, for almost 20 years large amounts of money and effort have gone into promoting a campaign on the theme 'if you drink, don't drive.' We'd like to know whether this has stopped anyone, or if it has had any effect at all on the number of alcohol-related car accidents. We have some doubts that there have been any changes, but if there have, we would like to find out exactly what caused them."

"Right now in the U.S. there are more laws controlling the use of liquor than the use of dynamite," Dr. Bacon says, "but there is little doubt that the major alcohol problems remain unsolved."

Don't fool around with LSD

The dangers of lysergic acid diethylamide (LSD-25) are becoming more obvious, writes Dr. Roy R. Grinker Sr., in an editorial in the American Medical Association's *Archives of General Psychiatry*.

The potent hallucination-producing drug, originally introduced to study mental processes, has now reached a dangerous state of indiscriminate overuse and serious mental illness and even death will occur unless controls are developed, Dr. Grinker asserts.



"From a research tool the drug has proceeded to fad. Latent psychotics are disintegrating under the influence of even a single dose; long-continued LSD experiences are subtly creating a psychopathology. Psychic addiction is being developed and the lay public is looking for psychiatrists who specialize in its administration.

"Here again is the story of evil results from the ill-advised use of a potentially valuable drug, due to unjustified claims, indiscriminate and premature publicity, and the lack of proper professional controls."

Dr. Grinker charged that many psychiatrists became so enamored with the "mystical hallucinatory

state" the drug produced that they subsequently became "disqualified as competent investigators."

The editorial was published shortly after Harvard University dismissed Dr. Richard Alpert, assistant professor of clinical psychology as a result of his research in the effects of the so-called "consciousness-expanding" drugs of which LSD-25 was the most powerful.

Another thing to stay away from is morning glory seeds. The seeds have been reported to have dangerous hallucination-producing substances similar to those in LSD, although a person would have to eat hundreds of them to get any effect.

The danger of mental disease for new mothers

There is a definite relationship between childbearing and mental illness, says a Harvard University research team in the School of Public Health.

The first three months after the birth of a baby carry the greatest mental risk for the mother.

The study was made with 355 women who were pregnant or had recently had babies. Their ages ranged from 15 to 44. The smallest risk of mental disease appeared to be in the middle of this age group, with the greatest risk at the extreme ages of childbearing.

Manic-depressive psychoses, in which melancholy alternates with an extraordinary sense of well-being, was found to be particularly common among the women.

How to avoid a heart attack

by Jeremiah Stamler, M.D.

Half the people who develop heart disease die within three weeks—many of them within one hour. The important thing is to prevent the first attack. It can be done.

As most adult Americans are painfully aware, from intimate experience with their families, friends and associates, diseases of the heart and blood vessels are responsible for an absolute majority of all deaths in the United States.

Among the several cardiovascular ailments, the No. 1 killer is arteriosclerotic heart disease. It alone is responsible for almost thirty percent of all deaths.

The underlying disease process responsible for heart attack is severe atherosclerosis or hardening of the main arteries supplying the heart muscle. Severe atherosclerosis produces extensive narrowing of

these coronary arteries and leads to a major complication, that is, thrombosis, or clot formation, resulting in complete block of blood flow and death of heart muscle (myocardial infarction).

The average, presently healthy, middle-aged American male, free of clinical coronary disease, has about one chance in five to developing this disease in middle age, that is, before age 65. It is, indeed, a high average risk.

The incidence rate is fairly uniformly experienced by all sub-groups in our middle-age urban male population: by Negro and white man, indoor and outdoor workers, men doing sedentary, light or medium activity work, and by white- and blue-collar workers (with a statistical hint that the blue-collar, semi-

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skilled, unskilled and service workers may be a little better off, but not remarkably so). Contrary to earlier misconceptions, the recent studies have yielded solid, consistent data showing that the toll exacted by coronary disease falls heavily upon *all* middle-aged American males, regardless of the kind of work they do, their income, scale of living, ancestry.

The Framingham findings

The disease is "epidemic," to use Dr. Paul Dudley White's term, throughout our middle-aged population. Findings accumulated during a long study of more than 5,000 men and women in Framingham, Mass., document a particularly pernicious aspect of the coronary disease problem.

Originally free of coronary disease, 242 of the 5,000 Framingham men and women developed it over the years. Eighty-three of the 242 (34 percent) died within three weeks of becoming ill; 46 (19 percent) experienced sudden death within one hour, that is, before any medical care could be given.

These facts deserve emphasis because they compel an important conclusion in view of the high rate of sudden death: *If effective progress is to be made against this dis-*

ease, if a real breakthrough is to be achieved, at least in middle age as a first objective, the focus of our effort must be on prevention of the first attack!

One of the remarkable achievements of recent research is the identification of susceptible individuals before they become sick and that people vary markedly in their susceptibility.

The average risk of the average American male (one chance in five of a heart attack in middle age) is, like many averages, an abstraction of only limited meaning. It is an average of very different risks, for there are those who have as high as one chance in two, or two chances in three or worse, of developing coronary disease before age 65. At the other end of the distribution, there are more fortunate individuals with a risk of only one in 20, one in 30, or one in 40.

First point worth emphasizing is the remarkably greater susceptibility of men compared to women, particularly prior to age 45, that is, before the onset of menopause in women. Middle-aged women are in general highly resistant to the disease. This resistance is the single main factor accounting for the six-year greater life expectancy of women and for the fact that there are more women than men in the United States, and that early widowhood is a major social problem. The greater susceptibility of men, however, should not be exaggerated, since women after the menopause develop an increasing coronary proneness.

Dr. Jeremiah Stamler is a professor at the Northwestern University School of Medicine and director of the Chronic Disease Control Division of Chicago's Board of Health.

Deaths from heart attacks are down

THERE IS REASON for cautious optimism. From 1920 until the late 1940's, the total death rate from all diseases of the cardiovascular system went up steadily for white men, age 45-54, in the United States. In the later 1940's, the death rate stopped rising for the first time in over 30 years. Then, in the early 1950's, it began to dip, and from 1950 to 1959 a phenomenon occurred that has been overlooked and unheralded: an actual decline, modest but definite, in mortality from the cardiovascular diseases, for all sex-race groups. The toll is still great, but it is possible that we are now over the hump.

The relationship between three key variables—blood pressure, weight and serum cholesterol (cholesterol in the blood)—and coronary proneness is illustrated in the Framingham study. Men with elevated blood pressure developed six times as many heart attacks as men with normal blood pressure. Overweight men developed twice as many heart attacks as men who were not grossly overweight. Men with high serum cholesterol levels developed six times as many heart attacks as men with lower levels. Those normal with respect to all three variables had only 10 heart attacks per 1,000 in four years, about a one-in-20 risk of developing coronary disease before age 65. Those with two or three of these abnormalities had 143 attacks per 1,000 in four years, a risk of about one chance in two of developing heart attack in middle age. These can be designated our high-risk men. The difference between the two groups is 14-fold.

Another important risk factor is revealed in studies involving several

thousand men during six- and eight-year periods. There is more than a six-fold difference in the fatality rate from heart attacks in cigarette smokers v. non-cigarette smokers. The studies also show a difference in rate of fatal and non-fatal heart attacks that is more than threefold.

Other coronary risk factors include: diabetes, thyroid disease, kidney abnormalities, lack of exercise, and a history of blood-vessel disease (atherosclerosis, hypertension) occurring prematurely (before age 60) in members of the family.

Medicine has also increased its knowledge in another area of vital importance for predicting risk. It has been definitely shown that certain abnormalities revealed by the electro-cardiogram (frequently found during routine examination of presumably healthy people) also portend an increased likelihood of developing heart attacks.

How frequently are coronary-prone persons encountered in our population? Studies of the employees of a large Chicago corporation

Formula for prevention:

1. Reduce.
2. Cut down on fats.
3. Stop smoking.
4. Control your blood pressure.

typify the general situation prevailing throughout our country.

Over 500 men per 1,000 (more than fifty percent) were found to be overweight; 284 per 1,000, markedly overweight; 283 per thousand had a high serum cholesterol level; 103 per 1,000 had frank high blood pressure; more than 400 per 1,000 were heavy smokers; 175 per 1,000 had a positive family history of premature blood vessel disease.

Preventive medicine

Something can be done about most of these abnormalities. Even with respect to family history, there is no reason for fatalistic hopelessness. For it is now known that to a large degree a family tendency to premature coronary disease results from familial tendencies to high serum cholesterol, to obesity, to high blood pressure, to diabetes. And it is quite possible for contemporary medicine to treat every one of these abnormalities if they are recognized early.

In any case, the coronary risk factors are often present without a positive family history and can be treated. High blood pressure can be successfully treated by diet and drugs, particularly when detected

early. Obesity can also be treated by reliable professional methods, although long-term control is a tough problem. Heavy smoking can also be eliminated. We now know that high serum cholesterol can be lowered in most cases by dietary means entirely compatible with the pleasure of good eating. Diabetes can also be controlled, like other risk factors.

It is a simple, logical conclusion that if these abnormalities make for increased likelihood of heart attacks and can be detected before attacks occur—and can consequently be corrected and controlled—then the possibility arises of preventing heart attacks.

Statistics show that heavy cigarette smokers who quit before they become ill will lower their coronary proneness down toward the non-cigarette smoker's level. This is a very encouraging fact.

Life insurance data indicates that obese men who reduce and stay reduced have a subsequent mortality experience like that of men who are not overweight. In studies over the last 5-to-10 years, the new hypertension drugs show that control of high blood pressure leads to fewer heart attacks, heart failures, strokes and kidney failures—complications

that produce illness and premature deaths in hypertensives.

Finally, there is a considerable accumulation of data collected in central Europe after World War I, and in the occupied countries during World War II, indicating that the changes in diet, exercise, and smoking which came from wartime conditions were associated with significant declines in mortality rates from heart attacks.

In Chicago there is now a Coronary Prevention Evaluation Program which works for long terms with high-risk men in the 40-59 age group. It strives to correct, *and keep corrected* (the decisive challenge), five abnormalities making for coronary proneness: overweight, high serum cholesterol, high blood pressure, heavy cigarette smoking and lack of exercise. Our research physicians and nutritionists work closely with the men and their wives to effect a permanent change in living habits. Short-lived efforts (the frequent American pattern of going on a diet, then going off) are futile.

The dietary approaches required to attain these goals have been worked out in great detail. In the language of nutrition, they involve diets *moderate* in total calories, total fats, poly-unsaturated fatty acids and carbohydrates; *low* in saturated fatty acids and cholesterol; and *high* in all essential nutrients (proteins, amino acids, vitamins, minerals).

In terms of foodstuffs this means:

Eat *more* low-fat dairy products (skim milk, buttermilk, cottage cheese); more lean cuts of meat and

poultry and moderate meat portions (four to six ounces, not 12 to 16); more seafood; more fruit desserts; more green and yellow vegetables. This also means:

Eat *less* cream, cheeses, butter; fewer fat cuts of meat; fewer cakes, pies and cookies. It means *moderation* with potatoes, rice, spaghetti and breads; with jellies, jams and honey—and alcoholic beverages.

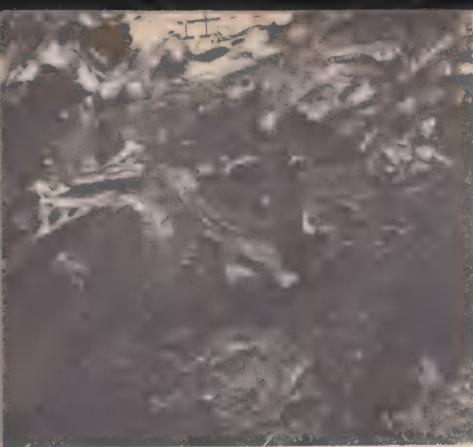
Many signs point to the possibility of preventing heart attacks, but at the same time, certain knowledge is not yet in hand. Therefore, the problem of an interim approach arises.

A choice of two ways

Two alternatives are possible. One might be called a more conservative alternative, and goes something like this: "All the new research information is very interesting and nice. It's good to see the research fellows making progress. We wish them luck. Admittedly, though, they haven't all the answers yet. In the meantime, therefore, I'll just wait and see."

The other approach is: "The facts point very strongly in certain directions. They indicate the possibility of prevention. Moreover, they indicate that this possibility can be achieved pleasantly and—even more important—safely."

It would seem, then, that a sound interim approach (particularly for the higher-risk individuals) would be to attempt to take advantage of prevention possibilities.



Los Angeles 60,000 years

Right in the middle of a bustling part of Los Angeles is a sticky lake of tar which contains some of California's early citizens

Photos by Jack B. Kemmerer

(Top left) A typical excavation at the La Brea Tar pits shows the bones of a variety of prehistoric animals.

(Center left) The tar pits in Hancock Park are completely surrounded by some of the busiest parts of Los Angeles.

(Left) In the early 1900s it was not uncommon for workmen at the tar pits to uncover bones of enormous animals.



The largest of all fossils recovered in the pits was an emperor mammoth.

by Jack B. Kemmerer

THE people of modern Los Angeles may feel they face some pretty sticky traffic problems. But their problems are nothing compared to those faced by the animals that inhabited the Los Angeles area 600 centuries ago.

At least today we ride on top of the tar. Earlier inhabitants were not so fortunate.

Concealed behind a wall of trees and shrubs and almost unmarked by signs, the La Brea Tar Pits are just off Wilshire Boulevard. Thousands of motorists drive past them

every day, but few know anything (except a few old Bob Hope jokes) about them. The pits, however, are well known to scientists, since they have yielded the world's most valuable collection of skeletal remains of ancient animal life.

Any animals that blundered into the purplish-black pools of the La Brea (Spanish for tar) Tar Pits were trapped—and preserved—for ever.

Their remains aroused modern scientists in 1901, after a young man named William W. Orcutt



A great condor-like vulture ended its life in the tar pits. From the well preserved remains scientists can estimate that it had a wingspread of about 12 feet.

rode out to old Rancho La Brea. He was a petroleum geologist and was interested in the ranch's old tar seeps and the possibility that they might contain oil.

Probing the seeps, he found many pieces of bones stuck in the tar-soaked ground. Orcutt had some knowledge of paleontology and realized that they weren't just ordinary bones. A little digging and inspection convinced the young geologist that here in the tar pits might be bones of prehistoric animals.

The existence of bones in the pits had been known for years. Back in

1769, Gaspar de Portola wrote of "the extensive swamps of bitumen and animal bones."

In the 1870's, Major Hancock, owner of Rancho La Brea, began selling the tar for fuel and as a roofing and paving material. Major Hancock's Chinese diggers uncovered so many bones that they were faced with a disposal problem.

Them dry bones

But when Orcutt saw the bones, he assembled some and sent them to Dr. John C. Merriam at the University of California. Dr. Merriam took one look and rushed to Los Angeles for a first-hand inspection of the tar pits. He discovered that here was a treasure far greater than any scientist could have imagined existed. The fossil remains in all of the world's museums at that time were nothing compared with the rich deposits apparently buried here.

In 1906, Dr. Merriam began excavating and his hopes were realized. The Rancho La Brea bones were not only numerous, but they were in an excellent state of preservation and represented a wide variety of prehistoric animals. To date, the fossils of more than 4,000 animals and 4,000 birds have been removed from the pits.

Although fossils taken from the pits are to be seen in most large museums of the United States, an exhibit in the Los Angeles County Museum in Exposition Park constitutes the largest and most varied fossil assemblage ever taken from

a single location. Scientists from all over the world came to study these prehistoric animals.

But no scientific training is required to enjoy and learn from the exhibit and many thousands of visitors are properly awed each year by these evidences of life in California during the Pleistocene period.

Some of the bones are enormous and the elephant skeleton mounted at the museum measures almost 12 feet to the top of the skull, and the skull itself is nothing you would like to carry for any distance.

Of the cats found in the pits, the most amazing and also the most frequently found is the saber-toothed tiger. Its two huge sword-like canine teeth make even a skeleton look ferocious. This animal was about the same size as the African lion. Unlike the lion, however, it was not fast of foot and depended entirely for its food on its

ability to grapple and fight at close quarters.

Other interesting animals found in the pits and reconstructed at the museum are early horses, several species of huge ground sloths and about 115 different types of birds. The bird fossils are a rare find for the paleontologists, since the delicate bones of birds are not preserved except under the most favorable of conditions.

It is now quite evident that nature, with an assist from petroleum, has made the La Brea Tar Pits one of the greatest wonders of the earth, preserving the richest bone record ever found.

In 1915, G. Allen Hancock, heir to the ranch, turned over the 23 acres on which the asphalt deposits are located to Los Angeles County, and Hancock Park was established, thus preserving for man what nature had preserved for 60,000 years.

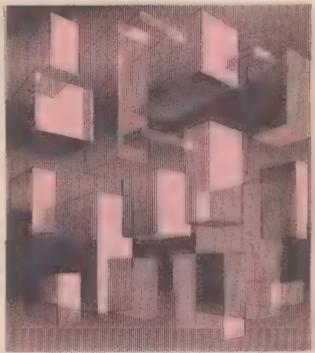


Diamonds from the sea

A SMART, enterprising Texan is making a daring sea raid on the near monopoly in diamonds held by phlegmatic Englishmen and Afrikaaners. In eight months the barge of Texan Sam Collins has sucked \$1½ million in diamonds off the ocean floor along the coast of South-West Africa. On the shore opposite his barge the giant de Beers diamond organization has a mine. The sea diamonds have probably washed away from this and other deposits on dry land.

Ten years ago Sam read about the underwater diamonds in an American magazine. De Beers knew about them, too, but didn't think they could be efficiently gathered. Trusting in his experience in laying underwater pipe lines and his inventiveness, Collins gambled where de Beers hesitated.

He shipped across the underwater trench-digging machine he had designed and put it to work scooping gravel from the bottom. Collins averages one diamond for every ton of gravel he processes and dumps over the side. De Beers gets only one diamond in 20 tons ashore.



INVENTIONS PATENTS PROCESSES

Science takes to the air

Science joined hands with aeronautics this summer in two ventures: an expedition to an uncharted area of the Andes, and a race with the moon.

Selection of an aircraft to fly eight men to an unexplored plateau was a major decision in the planning of the Andes trip. The Vilcabamba Plateau, 14,000 feet high in the mountains, near the source of the Amazon River, was the target of the expedition jointly sponsored by the National Geographic Society and the New York Zoological Society. Special equipment was needed to approach the area, as ground expeditions have been unable to penetrate the terrain.

A Helio Courier plane, designed to take off and land in short distances, was selected to fly the ex-

Inventor of

STANLEY FOSTER REED, a Washington, D.C., inventor, hopes to replace paper money with thin, square, plastic wafers. His "S-money" would, he says, last between 10 and 20 times as long as conventional bills and could easily be handled and counted by automatic machines.

The inventor holds Patent 3,092,402 for his novel medium of exchange. He has discussed it with Treasury officials, who so far have been non-committal. Before pressing for retirement of the familiar dollar bill, he is awaiting a U.S. patent on his "cast printing" method.

Cast printing means the incorporation of designs and letters in the plastic by the use of powder, which is picked up from impressions in a plate, somewhat as ink is picked up in engraving. The method has been patented in seven foreign countries.

The DuPont Company cooperated in the development work and, Reed says, has offered to make a special, distinctive nylon that would be difficult to counterfeit.

Besides visible markings, S-money (from Stanley's money, a shop name for the project) is to have edge

plorers. Three modifications were added by the All American Engineering Co. to make the plane even more serviceable for this trip.

One of them was a special arresting gear designed to stop the plane in a little over 100 feet on an air strip prepared by three men parachuted to the area in advance. As ground conditions were unknown,

the month

markings, by which mechanical or human fingers can distinguish denominations.

How much pocket space would S-money take up? The inventor says it would have less than a quarter of the facial area of present bills and would be less than four times as thick. After allowing for the wrinkling that swells paper money, he estimates its bulk at from 35 to 40 percent of that of paper. Wallets, he says, would be shaped differently but hold more dollars.

The ease of machine counting will, Reed believes, make possible completely automated deposit and withdrawal systems for commercial banks. Money could also be dropped through slots in cash registers, and change could be made automatically.

The inventor of the month is president of Technology Audit Corporation, a Washington firm that tells its clients how good their technology is. His S-money patent is assigned to American Scientific Corporation, Alexandria, Va., of which he is a director and principal stockholder.

At 46, Stanley Reed holds patents on some 15 other inventions, in-



Science Digest Inventor of the Month
Stanley F. Reed compares a thin square plastic wafer of his "S-money" with a conventional bill.

cluding a "dodging" camera. This camera gives proper exposure to all parts of a scene, some of which are usually in bright light and others in shadow. Several years ago he sold for \$100,000 his patents on what he and his co-inventors called "log-Etronics," a method of photographic printing.—STACY V. JONES.

the men felt they might have difficulty preparing a longer airstrip.

Attachments for the mounting of "Junior JATO" bottles, to give the plane a jet assist, were also added, along with a single-pole pickup system designed to allow the plane to pick up packages from the plateau without landing. This was to speed up the return of photographs and

samples of rock, vegetation, and animals to a base camp.

A second "science plane" was the jet transport which served as a mobile observatory and trailed the July 20 total solar eclipse on its path across the North American continent. A specially adapted Delta Air Lines DC-8 offered the observers a new way of avoiding



Special equipment was mounted on this Helio Courier to make it more serviceable for a group exploring the remote Vilcabamba Plateau of the Andes.

clouds or haze obscuring the sun at the time of total eclipse. It carried scientists above 85 percent of the earth's atmosphere and 99 percent of the water vapor that absorbs infrared radiation and interferes with certain measurements.

The length of time the eclipse could be observed was increased from 100 seconds, as observed from a stationary point in the moon's narrow shadow, to 144 seconds from the jet. The DC-8, flying at 42,000 feet over Northern Canada, at 520 miles an hour, chased the shadow as it sped across the continent at about 1,700 miles per hour. The expedition was known as Project APEQS (Aerial Photography of the Eclipse of the Quiet Sun).

Preliminary experiments led to some novel modifications in the aircraft for this particular flight. Among them: devices developed to prevent any vibration from being transmitted to mountings of the sensitive astronomical instruments.

Dissolving laundry bag

A water-soluble plastic laundry bag, designed to curb the spread of dangerous bacteria in hospitals, has been developed by the Reynolds Metals Co., Richmond, Va. The bags are made of a polyvinyl alcohol plastic film called "Reynolon." Tests at Petersburg General Hospital in Petersburg, Va., revealed that the use of the bags reduced airborne microorganisms by as much as 92 percent.

In practice, soiled linens are placed in the laundry bags immediately after they are removed from beds. The bags are tied at the mouth with a water-soluble tape which comes with the product. The closed bags are then placed in the washing machines where a cold flush releases the laundry by dissolving the bag's tie tape and seams which are soluble in cold water. The rest of the bag dissolves in hot water during the regular washing cycle. Distributed by Hospital Accessories, Woodside, N.Y., the bags are available in 24" by 32" and 32" by 32" sizes.

"Unaccustomed as I am to public speaking . . ."

New help for the captive audience is at hand, with the introduction of a device called the Talk Timer, intended to curb the long-winded speaker. It consists of a warning light system which can be pre-set by the chairman of the meeting.

The master unit has a panel of

three signal lights and an adjustable timer which can be geared to the length of time assigned to the speaker. On the podium, a second unit houses the signal lights to assist the speaker in pacing his talk. When he has five minutes left, a green light appears on both units. An amber light shows when he has two minutes left, and a red light shows that his allotted time has been used up.

More information is available from Talk Timer, 915-12th Street, N.W., Washington 5, D.C.

Notes on the campus

A notebook College Binder portfolio has been introduced by the St. Regis Paper Co., 100 S. Wacker Dr., Chicago 6, Ill. The binder is 11 inches long by 12 inches wide.

It has a three-post, loose-leaf filler pad for note-taking in the cen-

ter and a stretchable plastic pocket for filing purposes on the right. The pocket also contains a 60-page theme book. The front cover is secured by a magnetic latch. It can be folded flat under the filler section of the binder to facilitate note-taking. A case is built into the magnetic enclosure to hold pens, pencils and other equipment for field trips or laboratory work. The cover is vinyl and comes in a variety of colors.

*for the
home*



Musical desk

RCA Victor has added a new format to a familiar product in offering one of its stereo models in the form of a Danish-styled walnut desk. The Secretaire utilizes the company's new 100-watt amplifier, and an eight-speaker sound system with two 15-inch speakers. Also included is a stereo radio, and space for storing records.

Keeping baby's bottom dry

New comfort for wet babies is possible with the introduction of a product designed to keep the infant dry indefinitely. "Bobaby," a polyolefin cloth which is placed between the infant's skin and the diaper, permits urine to pass through to the diaper without remaining wet itself.



A filler pad, a cover which folds back to provide a convenient writing surface, and a pencil carrying case, are features of St. Regis Paper's College Binder.

It is of value in preventing diaper rash, according to the manufacturer, Lee-Colbert Co., Inc., 38-01 23rd Avenue, Long Island City 5, N.Y.

It can be laundered by conventional methods, by machine or by hand, or it may be sterilized by boiling. It is designed to be used with, not instead of, diapers.

Lightweight hair dryer

A lightweight, standing hair dryer, called "Le Salon" by its manufacturer, Schick, Inc., Lancaster, Penna., offers a choice of four temperatures. The hood is adjustable to any position, and is said to be large enough for any style hairdo. The dryer operates on standard 110-120 volt AC household current

A lightweight standing hair dryer, manufactured by Schick, is a new aid to achieving salon-type hair styles in the home.



and weighs less than 20 lbs. It can be wheeled about and can be stored in a relatively small space.

The manufacturer says a woman is assured she won't get more heat than she needs and doesn't have to wear hair nets or ear pads.

Push-button combination lock

A push-button lock with a possibility of 1,030 different combinations is being offered by the Thomas Edlyn Co., Dept. 73, P.O. Box 362, Collingdale, Penna. According to the company, you can change the combination of the lock in a matter of seconds, without tools and without dismantling. To open it, merely press the buttons in the order you have established. It is designed for use on wooden doors and drawers with thicknesses of from $\frac{5}{8}$ " through $\frac{7}{8}$ ". The face plate of the lock comes in either brushed chrome or copper with the buttons and trim in black.

Thread of many colors

Like the chameleon that remains unseen by blending with its background, Magicolor nylon thread assumes the color of the material it is stitched to. It is available from Magicolor Inc., 323 West 39th St., New York 18, N.Y. The manufacturer points out that the thread is moth and mildew resistant. In natural color, it blends with all bright colors. It also comes in a smoke color specially designed for blending with dark colors.



I'm going to kill myself

by Andrew Hamilton

ON THE first floor of a modern, two-story building at West Pico Boulevard and Vermont Avenue in Los Angeles, a telephone rings.

"Dunkirk 1-5111," answers the secretary pleasantly.

There is a pause at the other end

of the line. Then a voice mumbles: "I'm going . . . to kill myself . . ."

Unruffled, the secretary transfers the call to a psychiatric case worker. He listens calmly to the rambling voice at the other end of the line—all the while making notes on a four-page mimeographed form

called "Assessment of Suicidal Potentiality."

The would-be suicide is 47 years old, divorced, without money or a job, neglected by his family. He has obtained a gun and worked out an elaborate plan to kill himself. The case worker speaks only now and then, but conveys friendly interest and warm sympathy. Finally, he persuades the caller to come in and discuss his troubles in detail.

"You're the first person who's ever taken me seriously," says the caller. "I'll come in."

Daily drama

Such drama happens almost every day at the Los Angeles Suicide Prevention Center. In the course of a year's time, this unique organization receives approximately 1,000 calls—about half of them from people bent on taking their own lives, the other half from worried relatives, doctors and ministers.

About 400 calls each year are serious enough for follow-up interviews. In the five years of SPC's existence, the staff has counselled 3,000 persons seriously intent on self-destruction. Only ten are known to have committed suicide later.

The Los Angeles Suicide Prevention Center was established in 1958 and is financed by the National Institute of Mental Health, U.S. Public Health Service through the University of Southern California School of Medicine.

Co-directors are Dr. Edward

Shneidman and Dr. Norman L. Farberow—both 44—USC psychologists and internationally-known authorities on suicide. They are assisted by a staff of ten physicians, psychiatrists and social workers.

Suicide is the tenth ranking cause of adult death in the United States. Among adolescents and young adults it ranks third. According to the U.S. Department of Health, Education and Welfare, at least 20,000 Americans destroy themselves every year. Because suicides are sometimes "hushed up" or not reported, some authorities think the figure may be as high as 25,000 or 30,000.

On a world-wide basis, the U.S. rate of ten suicide deaths per 100,000 population is about average. Highest rates are to be found in Japan (24.1), Austria (22.8) and Denmark (22.5), while the lowest reported rate is to be found in Ireland (2.6). Within the United States, however, there is wide fluctuation—ranging from 20.7 in Nevada to 4.9 in South Carolina.

No regular fees

In the past five years, the Los Angeles Suicide Prevention Center has shown that human self-destruction is worth scientific investigation and has led the way toward greater interest in the subject.

SPC maintains an open switchboard for telephone calls 24 hours a day, seven days a week. The center submits no bills and charges no fees, but in cases where prolonged

(text continued on page 60)

Facts and fables about suicide

From experience with suicides over the past five years, Drs. Shneidman and Farberow have done much to clarify popular beliefs about suicide.

Fable: Most people who talk about suicide don't commit suicide.

Fact: Of any ten people who kill themselves, eight have given definite warnings of their intentions. Suicide threats and suicide attempts *must* be taken seriously.

Fable: Suicides happen without warning.

Fact: Studies reveal that suicidal persons give many clues and warnings regarding their intentions.

Fable: Suicidal people are fully intent on dying.

Fact: On the contrary, most suicidal people are quite undecided whether to live or die. They gamble with death—leaving it to others to save them. Almost nobody commits suicide without letting others know his feelings. Often this cry for help is given in "code," and such distress signals can be used to save lives.

Fable: Once a person is suicidal, he is suicidal forever.

Fact: Happily, individuals who seek to kill themselves are suicidal only for a limited period of time. Once they are saved from self-destruction, they often go on to live useful lives.

Fable: Improvement following a suicidal crisis means that the suicidal risk is over.

Fact: Most suicides occur within about three months following the beginning of "improvement," when the individual has the energy to put his morbid thoughts and feelings into effect. During this period, relatives and physicians should be especially vigilant.

Fable: Suicide strikes more often among the wealthy.

Fact: Suicide is neither a rich man's disease nor a poor man's curse. It is one of our more "democratic" illnesses and is represented proportionately among all levels of society.

Fable: Suicide is inherited or "runs in the family."

Fact: It does not run in families. It is an individual matter.

Fable: All suicidal individuals are mentally ill, and suicide is always the act of a psychotic person.

Fact: Studies of hundreds of suicide notes indicate that although the suicidal person is extremely unhappy, he is not necessarily mentally ill.

Fable: Suicide is against the law.

Fact: In only three states (New Jersey, North Dakota and South Dakota) are suicide attempts legally reportable. In most states the law is not involved unless there has been some disturbance of the peace or endangering of the health and safety of others. However, *helping* someone to commit suicide is against the law in most states.

treatment is required, it accepts donations ranging from 50 cents to \$10 a visit—depending on the financial resources of the patient.

"In telephone emergencies," said Dr. Farberow, it is essential to establish meaningful contact with the patient. Early in the conversation we try to get identifying information—even if it is only a telephone number.

"In this way we can get in touch with him again if contact is broken or if he simply hangs up. The chief thing we have to offer is hope. We try to respond quickly and to make him feel that he has called someone who understands."

The SPC case worker must evaluate the possibility of suicide swiftly and accurately. He knows, for ex-

ample, that divorced people are more likely victims than married couples, that Protestants have a higher rate than Catholics and Jews, and that Caucasians are more inclined than Negroes.

Drs. Shneidman and Farberow describe four kinds of suicide crises:

Impulsive: Some people turn to suicide in the heat of anger, disappointment or frustration. For example, a young man discouraged in love may walk in front of a moving car, or jump from a bridge. A young girl angry with her parents may slash her wrists or take too many sleeping pills. Such an emotional crisis may be temporary, but it is dangerously real and prompt recognition is necessary to prevent tragedy. Once the crisis is past, however,

Findings of the Los Angeles Suicide Prevention Center are shown dramatically in a film "The Cry for Help" produced by George Stoney for the Louisiana Association for Mental Health and for the National Institute of Mental Health. Photos are from the film.



the emotional state cools off rapidly. Professional counselling can help impulsive people to control their emotions.

The "life is no longer worth living" feeling: Over a period of time, some people become convinced that life holds no meaning for them. They do not feel wanted or needed. Or, they are inclined to give up in face of what they consider insurmountable difficulties such as unpaid bills, unemployment or old age.

In the grip of such a depression, a person may not realize such a hopeless feeling will go away in time. He should be helped to refrain from doing anything rash when under serious psychological pressure.

Very serious illness: A person who is in constant pain or who thinks he has a serious illness sometimes considers suicide as an escape. But hope can also be held out to him. Besides religious and moral arguments, there is always the possibility of a cure—if he stays alive.

Autopsies have been conducted on suicides who firmly believed they were suffering from incurable cancer or heart disease, only to reveal that they had no such illnesses at all.

"Communication" suicide attempts: Sometimes the motive behind suicide is to communicate a "message" to another. The person who threatens suicide may want to make a spouse, sweetheart or a parent change his ways. Or, it may be an effort to persuade him not to commit an unwanted act—such as a separation or a divorce.

A person making a suicide threat

(but not really planning to die) is gambling with death. Something may go wrong with his plans for being rescued. There have been cases where, as a "death threat," even mild dosages of sleeping pills have proved fatal. What was meant to be merely a communication became, instead, an actual suicide.

Talking of death

Research at the Los Angeles Suicide Prevention Center shows that eight out of ten suicides might have been prevented if the victims' families had been able to recognize certain clear-cut clues. Repeated talk of death or suicide is one. For example, here are remarks made by people who later destroyed themselves:

"My family would be better off without me."

"I'm going to end it all. I can't stand it any more."

"Here's my watch. I'll have no further use for it."

"I don't want to be a burden."

"This is the last straw. This is all I needed."

"I can't stand it any longer. I want to die."

Dr. Shneidman points out that many unhappy people who make such remarks are not necessarily suicide-prone, but it is a dangerous mistake to regard them lightly.

Making a will, discussing insurance policies, getting affairs in order are also signs to watch for. Taken by themselves, such activities may not indicate suicide. But coupled

Almost everyone who has been saved from suicide has been very, very grateful.

with other signs—prolonged illness, unhappiness or depression—they may.

Other clues: chronic sleeplessness, loss of weight (because of lack of appetite), withdrawal from social contacts, loss of sexual drive, loss of interest in hobbies, or similar changes that make a person markedly "different" from his usual self.

When suicide is suspected, family, loved ones and friends are in the best position to give emergency assistance. Dr. Shneidman said that the first step is frank recognition that a person, no matter how healthy and stable in the past, can be a potential suicide. The second step is to seek professional advice.

Unnatural experience

Long-term help can best be given by the following: a family physician, a psychotherapist, a religious counsellor or a social agency worker. In a few cities professional counselling is available at suicide "first aid" centers—such as Boston's Rescuer, Inc. (with a branch in Worcester, Mass.), New York's Save-a-Life League, Miami's FRIENDS, and Chicago's Emergency Call.

The suicide crisis is an unnatural experience in which a person needs help as surely as if he were fighting

a serious physical illness. Afterwards, he should be observed closely for at least 90 days, for other attempts at self-destruction may occur within this period.

In Los Angeles, the Suicide Prevention Center works closely with such other civic agencies as the County Coroner, the City and County Health Departments, the Police Department, the Sheriff's Office, the Welfare Planning Council and the State Department of Mental Hygiene. In addition, it maintains contact with some 50 social agencies.

For example, the County Coroner's Office may establish the manner of death (an overdose of phenobarbital or carbon monoxide from a car left running in a garage). But the Suicide Prevention Center may be asked to investigate whether it is an accident or suicide. On questionable cases, Drs. Shneidman and Farberow, plus Dr. Robert E. Litman, work closely with Dr. Theodore J. Curphey, the Los Angeles Medical Examiner-Coroner, as a "suicide team."

The death of Marilyn Monroe, for example, was determined by this team to have been "probable suicide." Incidentally, on the day following her death, 12 persons in New York and 10 in Los Angeles also took their own lives.

In the United States there is one suicide attempt every few minutes, and at least one death in every half hour. With proper education and research, such as that generated by the Los Angeles Suicide Prevention Center, Drs. Shneidman and Farberow believe these figures can be cut substantially.

"As our work becomes better known, we hope to reduce it even more in the years to come," said Dr. Farberow.

The question is sometimes asked, "If a person wants to commit suicide, why not let him?"

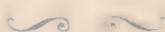
The answer is three-fold: (1) from a religious and humanitarian point of view, life is precious and we spend millions of dollars in the

control of disease, accident prevention and lifesaving operations; (2) suicide places heavy financial burdens as well as a moral stigma on the victim's family; and (3) one suicide may suggest another to those left behind.

Grateful for life

The clinching argument, however, lies in the fact that almost everyone who has been saved from committing suicide has been very, very grateful.

Many who have said, "I'm going to kill myself," have not done so because of counselling and research of the Los Angeles Suicide Prevention Center.



It's news, but it happened in 5500 B.C.

STAR-GAZERS in recent months have had a new celestial attraction in the sky. It is a so-called nova, discovered by Elis Dahlgren of Sweden. It was observed the following night by L. C. Peltier in Delphos, Ohio. The nova, really an old star that is exploding, appears above the bright star Vega in the constellation Lyra.

Astronomers at the American Museum-Hayden Planetarium say it is about 7,500 light years away (a light year is the distance light travels in one year at 186,000 miles a second), so that the eruption the earth has been witnessing actually occurred about 5500 B.C.

Dr. Kenneth L. Franklin says: "If this star is typical of the usual nova, it will return to its normal pre-outburst stage in about two years."

He adds: "Some objects have been known to give repeat performances and they do not seem to change much in spite of their action."

"For this reason, astronomers believe the explosions of ordinary and recurrent novae do not involve a major portion of the star. This is in sharp contrast to a supernova which, while it lasts, may radiate over 1,000 million times as much energy as the sun. A supernova explosion virtually destroys the star."

What ever happened to flying saucers?

A NEW book, *The World of Flying Saucers*, by Donald H. Menzel and Lyle G. Boyd (Doubleday, New York, \$4.50), should finally lay to rest the most persistent myth of modern times—the myth of flying saucers or UFO's (unidentified flying objects).

It *should* end this myth—but it won't!

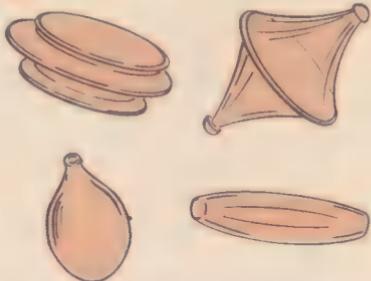
The diehard "saucerites" will leap upon the fact that the authors had the full cooperation of the Air Force in preparing their elaborately documented study. They will offer the fact as further evidence of the "gigantic official conspiracy to cover up the truth about the saucers."

Believers say saucers are spaceships from other worlds. But Menzel and Boyd conclude:

"No fact so far determined suggests that a single unidentified flying object has originated outside our own planet."

What are the saucers? Balloons, birds, clouds, a host of optical phenomena, etc., and in a few cases, deliberate fraud. That's a pretty dull climax to the excitement and near hysteria that gripped many in the late 40's and early 50's.

Indeed, the fact that the conclusion is so obvious and so ordinary explains why many have been led to reject it. All that fuss, they feel, couldn't have been over nothing.



Flying saucers have come in many shapes.

Others reject the conclusion for different reasons. They look to the sky as a release from the tension of the nuclear age. The intervention of benevolent people from other worlds, they feel, would surely solve all our problems. One branch of the saucer "movement" has even become tied up with mysticism and religion.

The more respectable "saucerites" (those who do not claim the little men have landed yet), see themselves as having discovered a great truth. But the government-military-scientific "establishment" is too stupid, or has darker motives, and will not recognize them. It is perhaps their anger with the "officials," rather than belief in space ships, that keeps them fighting.

The World of Flying Saucers is not for the believer. It will merely raise his blood pressure. But if you want a thorough and scientific explanation of the saucers, you won't find a better one.—D.C.



the progress of MEDICINE

by Arthur J. Snider

Who succeeds at dieting?

A GOOD share of the estimated 15 million overweight Americans have gone on diets—again, and again and again. The fact is, overall success appears to be temporary and limited. A majority of persons regain most of the pounds lost.

In view of the poor results, Dr. William G. Shipman decided to search for a method to distinguish those factors which lead to dieting success. The research, carried out at the University of Pittsburgh, involved two groups—those seen in a private physician's practice and those in a clinic.

Dr. Shipman found people over 50 usually do poorly. The well-to-do have more success than those in the lower economic status. People 60 percent or more overweight are less likely to be successful. Single women under 30 do well but those over 30 do poorly, as do widowed, separated and divorced women. Whites do better than Negroes.

Probably the most striking finding was that success in the first

week or month was a good indication of how the patient would do in the entire dieting period.

Emotional factors also played an important role. The long-term, successful dieters were found to be low in anxiety and to suffer from less depression than those who turned out to be unsuccessful.



Dr. Shipman says a prediction technique would permit realistic goals to be set and possibly save the dieter from the demoralization of failure. Confronted with such a patient, a physician would be able to say, "You seem too upset to undergo the rigors of diet right now. Why don't you seek some help for your emotional state and then come in for some dietary help?"

Too much medicine for children?

If Junior is sick, relax. In the vast majority of cases, he'll get well under his own powers and without reliance on miracle drugs, says Dr. Robert R. Lawson, head of pediatrics at Northwestern University Medical School.

It's a mistake for parents to insist that doctors give needless medicine to ailing children and it's a mistake for doctors to give in to such demands, the pediatrician contends.

Dr. Lawson believes early and persistent use of antibiotics can be harmful in some cases.

Stronger bones for elderly— a bonus of fluoridation

Introduced as a means of helping prevent tooth decay on a mass scale, fluoridated water is providing a bonus in the form of stronger bones for older people.



Dr. Frederick J. Stare of the Harvard School of Public Health says fluorides influence the deposit of calcium in the bones and thus help retard senile osteoporosis, a condition in which the bones become brittle and break easily.

Studies in England indicate that

fluorides also exert beneficial results in a disturbance called Paget's disease, a demineralization of skeletal structures.

The British studies also show that fewer bone fractures occur among elderly Americans living in a community served with fluoridated water.

A few more years

In November, 1947, Dr. Sidney Farber, director of research at the Children's Cancer Research Foundation, Boston, first demonstrated that a drug can retard the progress of leukemia in children. This tragically swift disease usually kills within a few months. The drug was aminopterin. In the somewhat more than 15 years that have elapsed since the discovery of the specific anti-leukemic chemical, other agents have been discovered and are currently in use. These include ACTH, cortisone, 6-Mercaptopurine, cytoxan and vincristine.

More than 1,200 leukemic children have been treated at Dr. Farber's clinic since 1947. Fifteen of these have survived from 5 years to 8 years and about 120 are still alive after 15 months.

Lots of things can give you a pain

Many people continue to complain of an aching back long after the physical reason for it has disappeared. One reason, says Dr. Allen Russek of New York City, is

that it serves as a convenient hitching post for all kinds of personal problems. In many cases the problem is a fear of cancer.

"Many people who reach middle age develop an understandable fear of death," Dr. Russek says. "They may not talk about it but it's there.

"Or he may blame his pain for whatever may be going wrong in his job or marriage or other aspect of his personal life. He doesn't want to give up his excuse.

"Then, of course, there are patients with workmen's compensation who tend to take a lot longer to recover than those without it," the New York physician comments.

Strawberry marks should be removed at birth

If a child is born with blood vessel tumors ("strawberry marks"), have them removed immediately, advises Dr. Wolfgang A. Casper, a New York physician.

He believes it is cruel to submit parents to the emotional stress of waiting the usual five years to see a small red dot grow into an ugly, mushy protuberance.

It's true that some of these tumors, called hemangiomas, disappear spontaneously but no one can predict which they will be.

The tumors are harmless. They rarely have a tendency to become malignant. But they grow fast in the first years of life and present a cosmetic problem. When small, they are quickly and easily removed by surgery.

TV is 'bad for the feet'

TV is said to be bad for a child's mind and a child's eyes—now it turns out it may be bad for his feet too.

Deformities of the feet can result from the "TV squat". This is the typical floor-sitting posture of children while watching TV. They sit with each leg doubled back at the knees with heels on the outside of each thigh. It's apparently a comfortable position.



Dr. Alfred R. Shands, Jr., visiting professor of orthopedic surgery, University of Pennsylvania, says the position causes a twisting strain on the thigh joint, even though the child may not feel it. If long continued, the feet can be thrown out of normal standing stance and take on a toe-in or pigeon-toed position in walking.

Dissolving and preventing kidney stones

Dissolving kidney stones has been a dream of doctors for centuries. But it's always been impractical. Solvents were too irritating or worked too slowly.

Now an organic solvent has been developed that appears to be effec-

tive against three types of stones which constitute about 40 percent of kidney cases. Dr. William P. Mulvaney of Cincinnati says the solution, hemiacidrin, is not only a good solvent, but also can be used to prevent formation in recurrent "stone-forming" patients.

About 180,000 persons a year are admitted to hospitals with a diagnosis of kidney stones. Surgery is the usual treatment.

Cancer and moldy peanuts new bane of turkeys

In 1960, a new disease killed over 100,000 turkeys in England. It was called "X" disease and quickly traced to the diet. The toxic agent, found to be contained in peanut meal, was labeled "aflatoxin." It was produced by a fungus. It occurs in mature peanuts harvested and stored under warm, humid conditions which damage the shell. Now the toxic agent has been found not only in peanuts but in grain products such as soy bean and corn.

Dr. Michael B. Shimkin, associate director for field studies of the National Cancer Institute, notes that in some areas of Africa, cancer of the liver is frequently found. It is known, he says, that moldy corn provides an important ingredient of African native diets.

The epidemic of liver cancer in rainbow trout in the United States is now firmly associated with dietary factors. Although present data suggest that the responsible factors are introduced by some processing pro-

cedures, the possible role of fungal products should be strongly considered, Dr. Shimkin advises.

The aging pilot— how good is his heart?

There has been a tenfold increase in the number of "over forty" flying personnel in the U. S. Air Force in the last seven years, says the journal, *Aerospace Medicine*. There also has been a significant increase in the percentage of civilian airline pilots over 40. Of the 5,840 airline transport airmen certified by the Federation Aviation Agency in 1961, 50.6 per cent were 40 years or over. In 1954, the percentage was a mere 20.9.



Capt. Victor E. Schulze, Jr., of the Air Force medical corps, notes that the over 40 group is entering the age when they will be challenged by coronary heart disease. He believes the careful medical checking of such large numbers of fliers to detect first signs of heart disease poses a problem unmatched in the history of military or civil aviation medicine.

Sudden heart attacks in drivers of automobiles or buses have already accounted for a large number of highway deaths.

YOUR SCIENCE ABC's

An elementary course in ELEMENTS

THE ancient Greek thinkers like Democritus (about 460 B.C.) put forward the idea that all substances were made of tiny particles, or atoms. These were thought to be hard and solid like very small bricks. For a very long time, very little was added to scientific knowledge. One of the ancient Greeks, Aristotle, wrote down his ideas about science, and these were thought to be absolutely right. No one questioned the truth of his work for hundreds of years, but later many things he said were found to be wrong.

A big step forward in our knowledge of elements was made by John Dalton (1766-1844) who believed, like Democritus, that all materials were made up of tiny bricks, or atoms. Unlike Aristotle, who thought that all substances were made of mixtures of earth, air, fire

and water, Dalton believed that there were many different kinds of substances, each with a different kind of atom, and that all other materials were made by joining these together chemically. The different kinds of atoms were called "elements."

This table used by John Dalton, showed elements known to chemists 150 years ago.

ELEMENTS

	Hydrogen	1		Sodium	23
	Azote	5		Barites	98
	Carbon	6		Iron	50
	Oxygen	7		Zinc	36
	Phosphorus	9		Copper	36
	Sulphur	13		Lead	90
	Magnesia	20		Silver	100
	Lime	24		Gold	190
	Soda	28		Platina	190
	Potash	42		Mercury	167

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ATOMIC ELEMENTS

ELEMENT	ATOMIC NUMBER	ELEMENT	ATOMIC NUMBER	ELEMENT	ATOMIC NUMBER	ELEMENT	ATOMIC NUMBER
Actinium (Ac)	89	Erbium (Er)	68	Mercury (Hg)	80	Samarium (Sm)	62
Aluminum (Al)	13	Europium (Eu)	63	Molybdenum (Mo)	42	Scandium (Sc)	21
Americium (Am)	95	Fermium (Fm)	100	Neodymium (Nd)	60	Selenium (Se)	34
Antimony (Sb)	51	Fluorine (F)	9	Neon (Ne)	10	Silicon (Si)	14
Argon (A)	18	Francium (Fr)	87	Neptunium (Np)	93	Silver (Ag)	47
Arsenic (As)	33	Gadolinium (Gd)	64	Nickel (Ni)	28	Sodium (Na)	11
Astatine (At)	85	Gallium (Ga)	31	Niobium (Nb)	41	Strontium (Sr)	38
Barium (Ba)	56	Germanium (Ge)	32	Nitrogen (N)	7	Sulphur (S)	16
Berkelium (Bk)	97	Gold (Au)	79	Nobelium (No)	102	Tantalum (Ta)	73
Beryllium (Be)	4	Hafnium (Hf)	72	Osmium (Os)	76	Technetium (Tc)	43
Bismuth (Bi)	83	Helium (He)	2	Oxygen (O)	8	Tellurium (Te)	52
Boron (B)	5	Holmium (Ho)	67	Palladium (Pd)	46	Terbium (Tb)	65
Bromine (Br)	35	Hydrogen (H)	1	Phosphorus (P)	15	Thallium (Tl)	81
Cadmium (Cd)	48	Indium (In)	49	Platinum (Pt)	78	Thorium (Th)	90
Caesium (Cs)	55	Iodine (I)	53	Plutonium (Pu)	94	Thulium (Tm)	69
Calcium (Ca)	20	Iridium (Ir)	77	Polonium (Po)	84	Tin (Sn)	50
Californium (Cf)	98	Iron (Fe)	26	Potassium (K)	19	Titanium (Ti)	22
Carbon (C)	6	Krypton (Kr)	36	Praseodymium (Pr)	59	Tungsten (W)	74
Cerium (Ce)	58	Lanthanum (La)	57	Promethium (Pm)	61	Uranium (U)	92
Chlorine (Cl)	17	Lawrencium (Lw)	103	Protactinium (Pa)	91	Vanadium (V)	23
Chromium (Cr)	24	Lead (Pb)	82	Radium (Ra)	88	Xenon (Xe)	54
Cobalt (Co)	27	Lithium (Li)	3	Radon (Rn)	86	Ytterbium (Yb)	70
Copper (Cu)	29	Lutetium (Lu)	71	Rhenium (Re)	75	Yttrium (Y)	39
Curium (Cm)	96	Magnesium (Mg)	12	Rhodium (Rh)	45	Zinc (Zn)	30
Dysprosium (Dy)	66	Manganese (Mn)	25	Rubidium (Rb)	37	Zirconium (Zr)	40
Einsteinium (Es)	99	Mendelevium (Md)	101	Ruthenium (Ru)	44		

Only a handful of elements were known to Dalton but today we have found 103.

Hydrogen is the lightest element. Dalton knew this, and although he was unable to find the tiny weight of a hydrogen atom, he called it "one" or unity. This made it possible to find out how many times heavier other atoms are than hydrogen. An oxygen atom was found to be 16 times as heavy as the hydrogen atom and so its atomic weight was called 16. The atomic weights of other elements were found. Atoms of helium have 4, carbon 12, and uranium 238 units of atomic weight.

We now know that each atom is not solid like a brick, but it is like a very tiny solar system. At its center is a minute core called the "nucleus," which contains a number of very small particles called

protons and neutrons, almost equal in weight to each other. The protons have a positive electric charge, and the neutrons have no charge at all. Round the nucleus, tiny particles called electrons revolve like planets around the sun. These electrons have a negative charge, but their weight is so very much smaller than that of protons and neutrons, that almost the whole weight of an atom is in its nucleus.

Now, each atom is given a number, according to the number of protons in its nucleus. This is not the atomic weight to which we referred above, for to get the atomic weight we should have to add the number of neutrons as well. Let us take examples of atomic numbers. Hydrogen has 1 proton in the nucleus

of each atom, helium 2, carbon 6, oxygen 8, and uranium 92. Therefore, hydrogen is atomic number 1, helium number 2, oxygen number 8, and uranium number 92. There are in all 92 natural elements, and each is numbered according to the number of protons in each nucleus.

The Russian chemist Mendeleev (1834-1907) found that some of the elements are very similar to one another chemically, and so when we look at a table of the elements, we find that they are grouped together in what are called "periods." In such a table, note that helium (He), neon (Ne), argon (A), krypton (Kr), xenon (Xe), and radon (Rn), form one such group. These are elements 2, 10, 18, 36, 54, and 86. They are all linked together because they are very like one another chemically. Every one is a rare gas, and (unlike other elements) they refuse to combine with others to

form compounds. Other elements are not so aloof, and some, like sodium, belong to groups that are very ready to unite with other atoms to form new substances. Table salt, for example, is a chemical compound of the element sodium and the element chlorine.

Most of the elements are metals, but there are a number of non-metals, such as sulfur and carbon. Several of the non-metals are gases at ordinary temperatures, and among these are oxygen, hydrogen and nitrogen.

Until World War II, it was thought that there could be no elements with higher atomic numbers than uranium, number 92. Since then, eleven elements have been made in the laboratory with the aid of atom-smashing machines and one of these (plutonium) has been found in nature. Now, 103 elements in all are known.



The detergent mess



by Bruce H. Frisch

Too many suds; too few. Cleaner, whiter clothes; dirtier rivers and drinking water. The postwar revolution in our cleansing habits has led to a complexity of claims and complaints. Here are the facts about today's and tomorrow's detergents, and what they do.

IN ABOUT a year, all-new detergent products will appear on America's supermarket shelves. Through this past, noisy spring, soap and chemical companies resisted demands by Congress, state legislatures and the press that they do something about suds in drinking water, rivers and sewage plants.

The industry answer, as expressed by the Technical Advisory Council of the Soap Association in a report last year, was that the real problem was sewage pollution, and the answer, greater numbers of more complex treatment plants.

Congressmen suggested it might

be more logical to outlaw the pollutant, a particularly indestructible kind of detergent called sodium alkyl benzene sulfonate (ABS), which is in 80 percent of household cleaning products. ABS is biologically hard, meaning bacteria consume only about half of it during sewage treatment. On the other hand, bacteria digest soap easily.

Industry experts pleaded in February it would take another three to five years of research to find a soft replacement. Hardhearted Congress scheduled hearings on anti-ABS laws for the middle of June. Eleven days before the hearings



Photos: Bruce H. Frisch

were to open, two chemical companies announced they would build two plants that would start making raw materials for soft detergents about September, 1964.

One benefit of the controversy is that it has brought out the facts about detergents. The Big Three (Procter and Gamble, Colgate and Lever Bros.) spend about \$400 million yearly on advertising and promotion. Yet the consumer knows little about the product he uses.

With a new flood of claims due in the coming year, some simple, basic questions take on a new urgency.

What is detergent? What can it do? And how does it do it?

Soaps are made from animal and vegetable fats and oils. Detergents can be made from oil- and coal-derived chemicals. During the oil and fat shortage of World War I, a

German chemist made the first synthetic detergent. A German company started selling it to industry in 1925. Through the thirties, industry continued to use most detergents (including Lestoil, 1933) although, for the consumer, Colgate brought out Vel, and P & G, Dreft.

Another oil and fat shortage in World War II stimulated detergent production, but it went to the armed forces. Then, after the war, the cost of fats and oils remained high, and detergents were able to compete with soap on price.

Various light-duty powders arrived on the market first. Powders in general have 15 to 40 percent detergent, with most around 20. In light-duty powders, the remainder is mostly sodium sulfate filler, an unavoidable byproduct which it would be expensive to separate.

In late 1946 and '47, fat prices dropped, and soap prices with them. Detergent was in danger of losing its newly gained market now that soap was again cheaper. Just in time, a heavy-duty detergent came out. Housewives loved it. Tide was in, soap was out. Detergent production passed soap in 1952.

Detergents caught on fastest in the hard-water Middle West. Calcium and magnesium in hard water turns soap into a greasy insoluble curd—bathtub ring. Until all the calcium and magnesium are removed, you are using soap as an expensive water softener.

With detergents, there is no waste and no ring. However, in soft water, soap still cleans best. Setting the

Commercial laundries still use good old soap because it cleans better and it's much cheaper.



cleaning power of plain soap at 100, plain ABS rates only 48. But in hard water, which plagues three-quarters of the country, soap cleaning power drops to zero while ABS drops only to 35.

Commercial laundries, the next to last stand for soap, take advantage of soap's high cleaning power and low price. They buy it in bulk and mix it with bulk chemicals for "building" the cleaning power of soap still further. These builders, such as phosphates, soften water and turn it alkaline. Soap cleans best at high alkalinity. So do synthetic detergents, and over half a package of heavy-duty detergent may be phosphates. The 15 to 25 percent sodium sulfate filler in heavy-duty detergents also acts as a mild builder. Built ABS detergents have a cleaning power rating around 80.

Since heavy-duty detergents for clothes washing contain most of the ingredients that appear in other products, let's look at what they are and what they do for you. We have already mentioned synthetic detergent, phosphate builders and sodium sulfate filler.

Soon after washday detergents came out, manufacturers started

getting complaints about corrosion in plumbing and washing machines. Compared to plain water, soap solutions inhibit corrosion. Some detergents promote it, partly by stripping the protecting film of grease from pipes. In addition, the alkaline solution especially attacks aluminum. The answer: the addition of roughly 5 percent silicate corrosion inhibitor.

Whiter than white

Another problem was that detergent couldn't cope with tattletale gray any better than soap. As the soap or detergent in wash water becomes more diluted—either from exhaustion or during rinsing—there are fewer molecules surrounding each chunk of dirt to keep them suspended in water. Eventually the dirt may redeposit on the clothes.

Almost by accident, investigators found that less than one percent of sodium carboxymethyl cellulose (CMC) stopped redeposition. No one knows exactly how, but scientists think that CMC gives clothes and dirt the same electrical charge so they repel each other.

No sooner had clothes lost tattletale gray than they were whiter than white.

How detergents pollute

The effects of detergent pollution have been apparent for 16 years. The first omen came on a crisp October day in 1947, when Lewis L. Klein looked anxiously out over his Mt. Penn, Pa., sewage treatment plant. A thick foam had started to cover the aeration tanks. Soon it had piled five feet high, buried the catwalks and spread over the surrounding lawn.

Mr. Klein's puzzlement ended when he learned that the previous day a company had blanketed Mt. Penn with samples of a detergent.

The incident was called a freak. But the use of detergents has grown ten times over what it was in 1947 until today more than a billion pounds of the most common synthetic detergent, ABS, are flushed down drains every year. Foam has sometimes spread to rivers. A canal in Europe was shut down until foam subsided, because officials feared someone would fall in and disappear under the suds. At the 1956 meeting of the American Association of Sanitary Engineers, it was reported that suds had backed up into sinks as high as the seventh floor of one apartment house. Heads of foam have appeared on drinking water where septic tanks were too close to wells. Biologists have assured homeowners that the small concentrations of detergent were not harmful. But, as with pesticides and fallout, no one is sure what long exposure to small doses will bring.

Similar problems have led West Germany to outlaw hard detergents, those not destroyed during sewage treatment, starting October, 1964.

Faced with the threat of more such legislation in Europe and here, chemical companies have been planning the manufacture of soft detergents for over a year.

As unlikely as that sounds, it can be true. New white clothes reflect 90 percent or more of the light hitting them. As fabrics, especially cotton, age, they yellow slightly and lose a few percentage points' reflectance. The traditional remedy was blueing, which combines with yellow to reflect white again. However, blueing absorbs some light, so although the clothes are white again, they are also duller.

Now detergent manufacturers de-

veloped a new kind of blueing, called optical bleach, or white dye, which blues by adding light, not subtracting it. Each molecule of optical bleach works like a fluorescent bulb, absorbing invisible ultraviolet light and radiating visible blue. Optical bleach does not work under ordinary light bulbs, because tungsten filament bulbs do not radiate ultraviolet light. Chlorine bleach destroys some optical bleaches. Sunlight also destroys much of the

**Those pretty white bubbles
don't do you a bit of
good; in fact, they can
sometimes cause a lot of trouble.**



optical bleach, although the bleaching action of the sun probably compensates.

Besides these working ingredients, detergents were given a psychological ingredient, a fatty amine, to make suds stiff and long-lasting. Suds don't help make clothes cleaner, but soaps foam, and if detergents didn't, the housewife might feel she wasn't getting her money's worth. Anyway, housewives have found suds helpful in gauging how much to use, and they prefer to look at sparkling white bubbles than dirty water.

Yet another ingredient was added to dishwashing detergents to make them suds sooner.

Getting rid of suds

Are suds harmless? Not in side-loading washing machines. There, suds interfere with the mechanical action. Products for these have low-sudsing detergents.

In dishwashers, suds are even more trouble because they interfere with the scrubbing action of the water spray. Most dishwasher compounds have no detergent at all, but are almost all phosphate. So much phosphate makes a highly alkaline

solution. It is so powerful that it can take the design right off a dish if it is on top of the glaze as it is in better ware.

Alkalinity, incidentally, is one cause of dishpan hands. It makes grease soluble, but is just as effective in carrying off the natural oils that are the first line of defense for our skin. The second line of defense is a web of protein keratin. Alkalines, soaps and detergents swell, soften, loosen and dissolve keratin layers, exposing the sensitive, easily damaged underlying skin. Allergies to one or more ingredients in cleaning compounds can add to irritation.

Detergents are probably slightly more irritating to skin than soap. High concentrations are more harmful. Doctors recommend avoiding long exposure, using fabric-lined rubber gloves or an emollient lotion to replace oils. Some cleaning preparations have an emollient built in.

Since alkalis attack skin and cloth fibers too, light-duty detergents for manual dishwashing and delicate fabrics are designed to give an almost neutral solution. Detergents make this possible, because they will clean in neutral or even acid solution, while soap, even by

How detergents clean

Detergents clean the same way soap does. They are both surface active. This means that one end of a molecule likes water (hydrophilic) and the other end hates water (hydrophobic). Hydrophobic ends try to escape water by attaching themselves to a hydrophobic surface, like dirt, thereby wetting the surface by acting as a bridge between it and the water. Wetting lets the cleaning solution creep into all the fine crevices. Then the molecules surround insoluble dirt and oil particles. The complete structure is called a micelle. As a whole, a micelle is soluble, because hydrophilic ends face outward. Dirt is simply floated away.

Hot water makes soluble dirt more soluble, and temperatures over 105°F melt most grease. By adjusting the chemical structure of a detergent, it can be made to work well at different temperatures.

Agitation contributes to cleaning by breaking up dirt and continually bringing fresh solution into contact with it.

The detergent of the future toward which chemists work is one that will clean in neutral cold water (neither alkaline nor acid) without agitation.

itself, naturally forms some alkali.

Many light-duty detergents are liquids. Back in 1946, they first appeared highly concentrated in little bottles. Customers couldn't bring themselves to pay the same for a small bottle as for a huge box. When the bottles were made bigger, sales improved. The contents are principally 6 to 20 percent detergent dissolved in water.

A more recent washday product, premeasured tablets and bags, is a packaging twist only. The detergent is the same as that in boxes.

In 1957, a flood of heavy-duty liquids appeared on the national market after Lestoil had been launched successfully in New England. Like heavy-duty powders, the liquids are built, and have just

about the same ingredients except for substitutions of compounds easier to package wet than dry.

Another class of detergents contains solvents like kerosene, turpentine or carbon tetrachloride, instead of water. While these add to cleaning power in many applications, they may harm synthetic fabrics and such things as plastic wall tile. In addition, they are combustible. (Combustible isn't as ominous as it sounds. According to federal labelling law, combustible means the solvent has to reach a higher temperature before igniting than something labelled flammable.)

By the late 1950's, soap held one last consumer stronghold—toilet bars. It was just too costly to form detergent into cakes. But after

Which detergent for what

Light duty powders and liquids (Vel, Joy) are for manual dishwashing and delicate fabrics. Liquids that give a neutral, nonalkaline solution—the easiest on hands and clothes—are principally detergent dissolved in water. Some liquids and powders also contain sodium sulfate, which makes them mildly alkaline.

Heavy duty powders and liquids (Tide, Lestoil, Handy Andy, liquid Ajax, Mr. Clean) are for washing machines or cleaning flat surfaces. Phosphates make these highly alkaline, thus better for cutting grease, but harder on hands and fabrics. In solvent type liquids (Lestoil) a combustible solvent replaces the water used in other liquids.

Automatic dishwashing cleaners (Calgonite) are almost all phosphate, so too alkaline for hands. Some have a little low-sudsing detergent (All).

Flat surface cleaners (Spic and Span, Oakite) are also phosphate based.

Scouring powders (Bab-O, Ajax) are for removing dirt caked on hard surfaces. Main ingredients are: grit, soap or detergent, dry bleach for stains, and alkali. The light-duty brands may not contain bleach and have soap instead of detergent (Bon Ami).

NOTE: The above brand names are given only as examples.

years of research, manufacturers developed economical detergent bars—only to have people complain they did not feel soapy. Manufacturers rushed in with another psychological ingredient—soap. Today the ratio of soap to detergent in a “bar” covers the whole range, including a little detergent and a lot of soap. In hard water, the detergent keeps the greasy soap curd dispersed in the water so it doesn’t form a ring. A bar contains up to 85 percent soap and detergent.

Another innovation in toilet soap was deodorant bath soap. Perspiration doesn’t smell. What smells are the products left after organisms on the skin break down perspiration.

These organisms are killed by a germicide in the soap. Germicide laundry detergents do the same for clothes as well as kill organisms that turn urine in diapers into skin irritating ammonia.

Such are the most significant ingredients in major detergent products today.

What will tomorrow’s be like?

Except for their softness, the new detergents due next year have been designed to be as much like the old ones as possible.

Unless you now have sudsy drinking water, you as a consumer may never notice the change. But you as a taxpayer will save on cheaper sewage treatment.



Trunk Murder?

Suffocation?



Strangulation?

HOW TO



.... SAVE A LIFE

THE pictures on the preceding page are not a demonstration of the techniques of murder—just the opposite, they show how to save a life with mouth-to-mouth resuscitation.

The victim in this demonstration is a perpetual breathless Scandinavian blonde named Resusci-Anne (34-24-34).

The Civil Defense program of New York's Chase Manhattan bank ran into problems while trying to demonstrate mouth-to-mouth resuscitation. The technique calls for some rather intimate contact and many volunteers would become embarrassed and squeamish.

So Anne was brought over from Norway. She doesn't get embarrassed and she never complains, which is only proper for a plastic and rubber training mannequin.

Anne arrived packed in a light green suitcase that opened to reveal her head and body neatly separated with a homicidal flair. She was, however, easily reassembled and revivified by a small hand pump.

In a few minutes she lay—suffocating—on a demonstration table. Her five-foot frame was covered by a blue sweat suit.

When air is blown into Anne's lungs, which have a capacity and resistance to air similar to an unconscious person, her chest expands. Since Anne's air channels function as a human's, it is possible to inflate her lungs only when her head and chin have been properly positioned. This resemblance adds a touch of realism to first aid training.

By tilting Anne's head back so that her jaw juts out, depressing her tongue to allow unobstructed air flow, and pinching her nostrils to prevent air escape, the rescuer breathes into her mouth until her chest rises.

After each appearance, Anne is deflated and returned to her suitcase. Despite her naturally retiring manner, she has proved a most successful teacher of artificial respiration while reaffirming an age-old observation about Nordic blondes: They take your breath away.

How we'll answer an SOS from space

by James H. Winchester

Trapping spaceships in trouble in a giant plastic bag is one of the methods now being studied.

WHAT will happen when a man in space calls for help?

Today, when a plane is downed on the ocean or the Arctic ice cap, in the jungle or amid towering mountains, a carefully coordinated and trained air-rescue team swings into action. But can such a team oper-

ate when a man is in trouble in space?

The Air Rescue Service of the U.S. Air Force says it can.

Keeping step with the space age, it is already looking ahead to the eventual and inevitable task of rescue at distances ranging out from

Two stages of "bagging" a troubled space vehicle are shown. Rescue craft approaches vehicle with bag open (lower left), bag is then sealed with vehicle inside.



300 to 100,000 miles from the earth.

The area of close-orbit satellite operations—(300 to 10,000 miles) will be the area of greatest concentration for space rescue work. To seek out the location of satellites in trouble in this belt—as well as at extreme altitudes 10,000 to 100,000 miles from earth—the Air Rescue Service will have to use highly maneuverable vehicles. These could operate either from earth bases or from other satellites, probably a combination of both.

Tricky task of returning

Tracking and computer equipment will be used in rescue satellites to determine the orbit of the vehicle in trouble. This information will then be fed to the rescue spaceship as it blasts off from earth, and would guide it to the rendezvous.

Once the target is intercepted, the most likely plan will be to launch a smaller, even more maneuverable, manned rocket which can lock onto the target, make the rescue, then jet back to its "mother" ship for return to another space platform or back to earth.

This tricky task of getting safely back to earth is one of the keys to the problem. Currently it is being studied by the Armour Research Foundation of the Illinois Institute of Technology at Chicago, under contract to the Air Force's Systems Command.

A re-entry vehicle returning from a 300-mile orbit might land anywhere in an area of as much as 25-

million square miles. For example, a crew making an emergency escape from an orbiting space vehicle over Australia might land anywhere in the United States. This problem will become even more complicated when space rescue vehicles re-enter the earth's atmosphere at higher, superorbital speeds of more than 36,000 feet per second.

The Armour study is highly classified, but, says the Air Force, it is built around a theoretical re-entry vehicle having three crew members or fewer. One of the possible recovery systems for this emergency escape capsule is by parachute. Another approach would allow the vehicle to land itself, under control, through a system of airfoil wedges, flaps and extendable wings.

Another space rescue approach, under study by California's Space-General Corporation, also under an Air Force Systems Command contract, is the use of a paraglider, similar in design to the sail planes used during World War II. Named "Project First," this space lifeboat, according to Dr. R. F. Brodsky, Manager of Space-General's Technical Staff, is looked upon as a solution to the problem of returning the entire crew of a large orbiting space station in case they have to abandon ship. Every space station would carry an individual life boat for each man aboard.

Secured outside the space vehicle in small, compact packages, these escape craft, at the abandon ship signal, could be quickly and easily inflated into paraglider form—a

Repair in space



A system for repairing unmanned space vehicles was proposed recently by Douglas Aircraft Co. It involves the use of the Astro, a delta-winged vehicle which could be launched into space, with the aid of a booster, and land back on earth at a conventional airport. The vehicle could carry a smaller and more maneuverable "space robot." This manned robot could then be used for actual contact with the orbiting vehicles. Douglas also believes the versatility of the Astro design would make it ideal as a shuttle vehicle for ferrying personnel and supplies to and from space stations, for reconnaissance, satellite surveillance, and rescue operations in space.

delta wing with a cylindrical capsule beneath it to hold the man. If the time came to launch the paraglider, the protective canister containing the packaged paraglider would be ejected from the space vehicle by a separation mechanism. The package would be attached to the vehicle by a cable. At a safe distance, it would be inflated by pulling a lacing, similar to a parachute ripcord. The capsule could support a man for about five hours.

To get into this space lifeboat's capsule, the spaceman would use a dorsal mating-type hatch attached to the space station. The life boat would be stored in a protective cocoon next to this hatch outside the

space station. After the man is inside, the lifeboat package would be let out on its tether and inflated. When the life boat is fully inflated it would jet away from the disabled station and bring its human cargo safely back to earth.

Reaction jets on this proposed glider, for control of attitude, would use nitrogen from the inflation gas supply for fuel. Attitude control jets would be used, after the paraglider is disconnected from its umbilical cable, to pitch the life-saving vehicle back down toward earth. Space-General's engineers estimate that to transfer a man from a large space vehicle into the paraglider's capsule, get it inflated and the sys-

There will be very little actual assembly work in space, says one expert. It's too costly and too dangerous.

tems set up and working, and arrive at re-entry from a 320-mile high orbit, would take approximately 26 minutes.

Freeman D'Vincent, of General Dynamics/Astronautics' Advanced Studies Department, recently reviewed his concepts of the problems of emergency escape from orbit for *Science Digest*.

"Rescue in space may be divided into three types," he says. "First, there is the recovery of a man who has left his spacecraft in a spacesuit or space taxi and has become immobile due to loss of orientation, unconsciousness, inability to react properly, or loss of his attitude control or main propulsion system. Secondly, there is a disabled spacecraft itself, drifting through space, where the man or men inside must be rescued. Third is the spacecraft that can be repaired and then be able to continue along its course."

The first, as D'Vincent sees it, is a case where man ventures out in his spacesuit. "My own conviction," he says "is that this would be a very unusual situation. He may wander out along a cable guide to inspect or make emergency repairs, but almost never to engage in assembly work."

Very little actual assembly work will be done in space, as D'Vincent

foresees it. It is too time consuming, dangerous and costly.

"In general," reports this General Dynamics/Astronautics scientist, "all possible assembly work will be completed on the ground and launched into orbit by a large booster. If units are too large for the booster, then, mating will be necessary in orbit. The simplest type of connection will be provided."

Space rescue problems could develop, though, if a man were detached from his main spacecraft in a spacesuit or space taxi to supervise such assembly. In such a case, D'Vincent thinks, the rescue would have to be effected by some method from the nearby spacecraft, rather than from the ground.

Chasing the target

In describing the second type of rescue operation—the saving of men inside a disabled spacecraft drifting through space—he is more explicit. In this case, a three-man rescue capsule would be launched from earth, its path computed to rendezvous in the general space rescue area. Enough propulsion and controls would be provided on this capsule to enable it to chase its target in orbit.

When the rescue capsule is within visual sight of the target, a polyethylene skirt is ejected from it. Gas is released into the skirt's inflatable structural tubes, forming the skirt frame and shape.

Looking like an open, inverted cup, this skirt is used to catch the disabled capsule. The rescue skirt is then cinched tight at its open end, forming a polyethylene bag with the "saved" capsule inside. Air is then released into this tightly sealed bag, pressurizing it to about the same pressure as the two capsules. The astronaut in the captured capsule can open his hatch and step out to enter the rescue vessel through an opening leading down from the air-filled bag. If he is incapacitated, the rescuers can leave their capsule to save him. Once he is safely inside the life saving capsule, however, the bag is separated

from the rescue vehicle and retro-rockets are fired to return the rescue ship to earth.

Saving lives

"The third type of rescue," says D'Vincent, "pertains in general to interplanetary operations, where an element such as loss of propulsion occurs at great distances from earth. In this case, repair would be attempted from an accompanying ship of the interplanetary convoy. If repair is impossible, then transfer of personnel to another craft will be necessary, again by a method still to be devised."

Whatever form or system space rescue operations eventually take, the Air Force's fabled life-saving service, in space as in the air, is ready to perpetuate its motto: "That Others May Live."

Hard life in the big city

THE soft-spoken Mabaans, who live a quiet life among the swamps of the Blue Nile in Sudan, hear better than their opposite numbers in the United States.

Back from the bush, Samuel Rosen of Columbia University's College of Physicians and Surgeons, reported that Mabaans in their 70's hear as well as many Americans in their 20's. Constant noise is partly responsible for the slow deterioration in hearing most Americans suffer, Dr. Rosen thinks.

Another contributing factor, he feels, is the constant stress and strain of modern civilization. It leads to atherosclerosis, fatty deposits in the blood vessels, which may reduce the flow of blood to the ear.

Going no farther afield than the Philadelphia zoo, Dr. Herbert L. Ratcliffe, professor of pathology at the University of Pennsylvania Medical School, found more evidence against modern life.

Over an eight-year period he noted among mammals in the zoo a tenfold increase in heart disease, of which atherosclerosis is an important cause. Dr. Ratcliffe blamed a rising population in the zoo.

Urban living is doing the same to men, he believes, as a result of greater social interaction and economic competition.



The end of the Earth

IF NUCLEAR war doesn't do it first, the Earth will eventually burn up.

That's the outlook for this planet predicted by George Gamow in *A Planet Called Earth* (\$5.75, The Viking Press, New York). Dr. Gamow, a physicist, takes in the origin as well as the end of the earth in his book.

He describes the future thus:

"The Sun is today in the middle of its expected life span, with 5 billion years behind it and another 5 billion years ahead. When, in that distant future, the hydrogen content of the Sun's core is completely exhausted, 'nuclear fire' will spread out into outer layers which still have untouched amounts of hydrogen. The body of the Sun will begin to expand and the Sun will swallow the inner planets Mercury and Venus, and its red-hot surface will advance toward the Earth.

"Even if that expansion is checked short, our oceans will boil and the surface rocks become red hot."

In explaining how the Earth and the other planets were formed, Dr. Gamow adheres to the theory propounded by a young German physi-

cist, Carl von Weizsäcker, in 1943. "Weizsäcker was able to show that the fine dust originally scattered through the entire region now occupied by the planetary system must have been aggregated into a few big lumps to form the planets, within a period of about 100,000,000 years."

Between its birth and its death, the Earth has experienced, and is still in for, a succession of ice ages. The remnants of the last one, says Dr. Gamow, will disappear "after many millions of years." Then our climate will be pretty much the same the world over and the year 'round. But "after another hundred or two hundred million years, new periodic glaciations will ensue."

The story of life on Earth and elsewhere, told in Dr. Gamow's zestful style, adds to his lively book. He finds the prospect of any intelligent life on our sister planets dim. Maybe beings like ourselves have developed in other planetary systems. But if they have, they haven't come to visit us.

Oh, well, we've still got 5 billion years—maybe.—H.P.

What you **hear** and what you don't

by John and Molly Daugherty

SOUND affects all of us; though we are so used to it, we seem unaware of many of the sounds we hear.

To hear sound, you have to have a vibrating source within an audible range, a medium capable of transmitting the sound to your ear, and an ear capable of receiving the sound.

What else do you know about sound? Try this quiz and find out:

1. Ultrasonic waves, which have a greater number of vibrations per second than your ear can hear, have been used to
 - a. Freeze ice cubes.
 - b. Clean surgical instruments.
 - c. Create an absolute vacuum.
2. Three children are playing and yelling. Two of them team up against the third one. All yell equally, yet
 - a. The two together sound louder than the third one alone, but not twice as loud.
 - b. The two sound exactly twice as loud as the third one alone.
 - c. All three together sound three times louder than one alone.
3. You can hear the highest frequencies of sounds when you are
 - a. A young child.
 - b. An adult of 22.
 - c. An adult of 45.
4. Two ears help you locate the direction of sound because the sound
 - a. Is of higher pitch in one ear.
 - b. Is louder in one ear.
 - c. Reaches one ear before the other.
5. Sound travels most rapidly through
 - a. Brick.
 - b. Glass.
 - c. Water.
6. You can hear the referee's whistle over the noise of the game because
 - a. A high-pitched note travels faster than a low one.
 - b. The higher the pitch, the louder the sound if the intensity is equal.
 - c. High-pitched notes are more rapidly absorbed by the materials they strike.
7. You can hear the difference between middle A on the piano and the same A on the violin because
 - a. The notes differ in the number of vibrations per second.
 - b. The A note on the piano is louder.
 - c. The number and intensity of overtones differ.
8. Your ear can hear a maximum range of
 - a. 5 octaves.
 - b. 10 octaves.
 - c. 20 octaves.

9. The material needed to transmit sound must be
 — a. Elastic.
 — b. Brittle.
 — c. Gummy.

10. Two sounds under certain conditions can destroy each other and produce silence when
 — a. The crest of one wave is opposite the trough of another.
 — b. The loudness of one overrides the other.
 — c. The sound waves interfere with one another.

ANSWERS:

1 - b An ultrasonic washing machine has been developed to clean surgical instruments. It rapidly gets rid of dirt, blood, and tissue. Ultrasonic waves have also been used to create very high pressures thousands of times greater than air pressure and to heat up small areas of metal surfaces for welding.

2 - a Loudness increases in loga-

The wave patterns produced by different sounds can be recorded visually by means of various types of instruments. Here is what some human and animal sounds look like. The wave pattern recordings were made at Bell Telephone Laboratories.



SONG — TRAINED SOPRANO VOICE



BIRD SONG — WHIPPOORWILL



LAUGH



PIGS — GRUNTING AND SQUEALING

rithmic, rather than in arithmetic, proportion. According to Fechner's Law, the stimulus must increase in geometric progression for the sensation of sound to be twice as loud. Thus the intensity of sound from the two boys' yelling has to be ten times greater on a decibel scale to sound twice as loud, as the sound a single boy can produce.

3 - a An adult can hear 20 to 20,000 vibrations per second. There may be exceptions, however. A young child hears frequencies as high as 40,000. As he grows older, his eardrum (tympanic membrane) thickens, and the connections from the eardrum to the inner ear do not transmit the higher frequencies so readily. Adults over forty show a progressive decrease in their ability to hear high frequencies.

4 - c If sound gets to one ear thirty millionths of a second before it gets to the other, your ear can detect the difference. Most sounds reach one ear before the other unless the sound comes straight ahead or behind you.

However your ear is not very sensitive to slight differences in loudness. It takes a 26 percent increase in intensity for your ear to detect the difference.

5 - b The velocity of sound through glass varies from 16,400 ft. per second to about 19,700 ft. per second, depending upon the variety of glass. In air, the velocity is only 1088 ft. per second at 32° F., but it in-

creases 2 ft. per second for each degree rise in temperature. The velocity in brick is nearly 12,000 ft. per second, and in water, about 5,000. The velocity in salt water is slightly higher than in fresh water.

6 - b Your ear is most sensitive to sound several octaves above middle C—around 3,000 vibrations per second. High-pitched sounds require less energy to produce than low-pitched ones. The referee would have to blow a low-pitched whistle too hard. Your sensitivity to high pitch explains why a child's shrill scream demands your attention.

7 - c When you strike middle A on the piano, the string vibrates 440 times per second. This vibration rate is called the fundamental frequency or pitch of a note. But the string may also vibrate in segments at the same time to produce multiples of 440. The first overtone is 880, twice the frequency of the fundamental. The second overtone is three times 440—1320 vibrations per second, and so on. The overtones blend in with the fundamental note to change its timbre or quality.

The number and intensity of the overtones on the violin differ from those on the piano, although the pitch is the same.

8 - b Each octave doubles the frequency preceding it. Assuming a frequency of 20 vibrations per second as a starting point, one octave above is 40, two octaves above is 80, three is 160, ten octaves above is

20,480 vibrations per second, a little above the average limit of audibility. A grand piano has slightly more than seven octaves.

9 - a Elastic materials have a tendency to return to their original condition after compression or distortion. Air is quite elastic. Elastic materials may include solids, liquids, and gases. The transmission of sound depends upon two main factors: elasticity and density. The proper modulus of elasticity for the different states of matter must be used in calculating the velocity of sound. Because cork and other in-

sulating materials have little tendency to resist changes in shape, they make good absorbers of sound.

10 - a When two sound waves equal in wave length and frequency are opposite in phase, the addition of the waves produces no displacement of the air. No sound is heard. Two sound waves are opposite in phase when the crest of one is opposite the trough of the other.

Both prongs of a tuning fork send out identical waves. If you hold the fork at a 45° angle near your ear, the waves will be opposite in phase. You won't be able to hear the sound.

SCORING YOUR ANSWERS

9 - 10 right—You really sound off on sound!

4 - 8 right—Develop a listening ear, and you'll be surprised at what you hear.

0 - 3 right—Silence is golden where your score is concerned.



Science in the news

The United States is going to cut back the output of nuclear weapons. That's the best guess of experts who have been following developments in Washington. The reason: Our nuclear stockpile is now enough to provide the blast equivalent of more than 14 tons of TNT for every human being. That means we could destroy the Soviet Union's cities and industrial centers 231 times. The U.S.S.R. in turn could do the same for the U.S. and NATO countries 145 times.

Now atomic energy will be directed more to helping people live. President Kennedy announced that the amount of fissionable uranium-235 available for use at home and abroad will be doubled. Observers even see the U.S., Britain and Russia--the big atomic powers--in a trade war to find new markets for surplus enriched uranium.

Meanwhile, Red China strives to catch up. In armaments, science and industry, it admits it's 10 to 20 years behind other powers, but it hopes a crash program will more than overcome the big lag.

Science in the news

The American Medical Association is turning over a new scientific leaf. It announced it will establish and operate a new Institute for Biomedical Research. A spokesman said the institute will be dedicated to pure, basic, non-disease-oriented research, with "maximum freedom from external pressures." The institute will be located in Chicago and will start work in 1966. The AMA also took steps to jettison its existing science programs. An AMA committee had criticized their work for their "debatable quality."

Economic sidelight: Better health is worth money. The National Health Education Committee said that medical research from 1944 to 1961 saved the lives of 2½ million Americans. And it said that the wage earners among them paid Uncle Sam \$900 million in taxes in '61 alone.

The role of technology in medicine got a new boost. The Federal Government put up \$2.8 million to support a new center that will provide costly computer facilities for use in medical research. It will be run by New England universities and institutions.

Public health shorts: The 1963 Asian flu epidemic killed 11,125 Americans. Interstate distribution of Krebiozen, an anticancer drug, was outlawed. The Public Health Service warned against cracked eggs--they may be infected.

Congress is going to keep a sharp eye on space expenditures in the future.

The House Science and Astronautics Committee cut \$473 million from the \$5,712 million Kennedy requested for the National Aeronautics and Space Administration. Chief items to suffer: The manned space program and research. A subcommittee criticized NASA for its failures in the Ranger program to study the moon with a vidicon camera, a gamma-ray spectrometer and other instruments. Five Ranger shots failed.

What's all the lunar hurry? America's haste to put a man on the moon got another rough going-over. British author-scientist Sir Charles (C.P.) Snow said Americans are too touchy about Russia's space feats. We should not go "all-out" to reach the moon, he said, but should proceed at a "natural" pace. And British astronomer Sir Bernard Lovell, fresh from a trip to the U.S.S.R., said he saw no evidence the Russians felt putting a man on the moon was desirable. President Kennedy said that should not deter us: "The point always has been the capacity to dominate space, which would be demonstrated by a moon flight."

After the moon, what? NASA gave Boeing a \$196,000 contract to study whether we should set up a lunar base where we could study the skies beyond. Another plan envisions an orbiting space laboratory. A decision is due in 1964.

Science in the news

When is an airplane a space vehicle? Two news items indicate that the difference is relative: 1. Test pilot Joe Walker took the X-15 plane up to almost 67 miles. 2. The Air Force ordered design studies of what it called an "aerospace" plane--"a manned, winged, earth-based vehicle which emphasizes the use of air-breathing propulsion."

Preliminary findings in the study of the sun during July's solar eclipse: Elongation of the corona was less than expected, considering the presently low solar activity in the sun's 11-year cycle. Scientists speculated that the effects of solar activity lag far behind the activity itself.

An old dream--using tides to produce power --was officially revived. Secretary of the Interior Stewart L. Udall recommended that the Army Engineers build a project to tap the tides in Passamaquoddy Bay, on the U.S.-Canadian border. The tides rise and fall as much as 50 feet there. Udall said the project would generate 1 million kilowatts one hour each day. Kennedy gave the project enthusiastic support. He ordered talks with Canada to begin "immediately."

An even older dream--to link England and France--got a new boost, too.

The Channel Bridge Study group came up with a plan for a bridge with a five-mile tunnel link in mid-Channel.

A radical new theory has been offered that may "open a wide field for cancer research." Dr. Albert Szent-Gyorgyi of the Institute for Muscle Research in Woods Hole, Mass., has discovered two substances in animal tissues--one that promotes growth, another that retards it. They're called promine and retine. Reporting in "Science," journal of the American Association for the Advancement of Science, he says: "Promine makes cancer cells grow faster, while retine tends to stop their growth and can make cancer, already developed, regress." Hoped-for advantage: cancer treatment without toxic side effects.

The U.S. and Russia plan new plumbings of the ocean depths. A new bathyscaph is due to succeed the "Trieste" soon. It's bigger, not so slow and more maneuverable. Russia plans a bathyscaph for 2,000-meter dives.

QUOTE OF THE MONTH: "It is our immense good fortune to be alive at the first moment in history when the tantalizing problems of the beginning of life on earth and the possibility of life on other worlds can be approached with rigor and in detail. To hold the keys to these ancient riddles is a triumph of the highest order; it heralds an age of exploration and discovery unsurpassed in history."--Dr. Carl Sagan, Assistant Professor of Astronomy at Harvard University.

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This statue depicts a murder that actually happened. It's from the collection of a judge in Canada's far northwest who tried the murder case. For other examples of this remarkable collection of Eskimo sculpture, see page 5.



She may be only a dumb blonde but she is a very useful one, as you'll see on page 79.



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Detergents have been in a lot of hot water lately, in more ways than one. Learn all about detergents, what they can do and what they are doing but shouldn't. Page 72.



This man is contemplating suicide. Read what science has discovered that will keep people from taking their own lives. Page 57.

